ARTMENT OF TECHNOLO
AND ERIE COUNTY PUBLIC LI

DECEMBER 7, 1957
VOL. 153—NO. 23

Telephony

THE JOURNAL OF THE TELEPHONE INDUSTRY

MORE JOBS BY POWER

Power tools are finding more and more jobs to do in telephone plant work. Here plant men of the Cincinnati and Suburban Bell Telephone Co. are using a tool to duct rod cable.

Guaranteed Circulation This Issue
14,604 of Which 10,702 is Paid

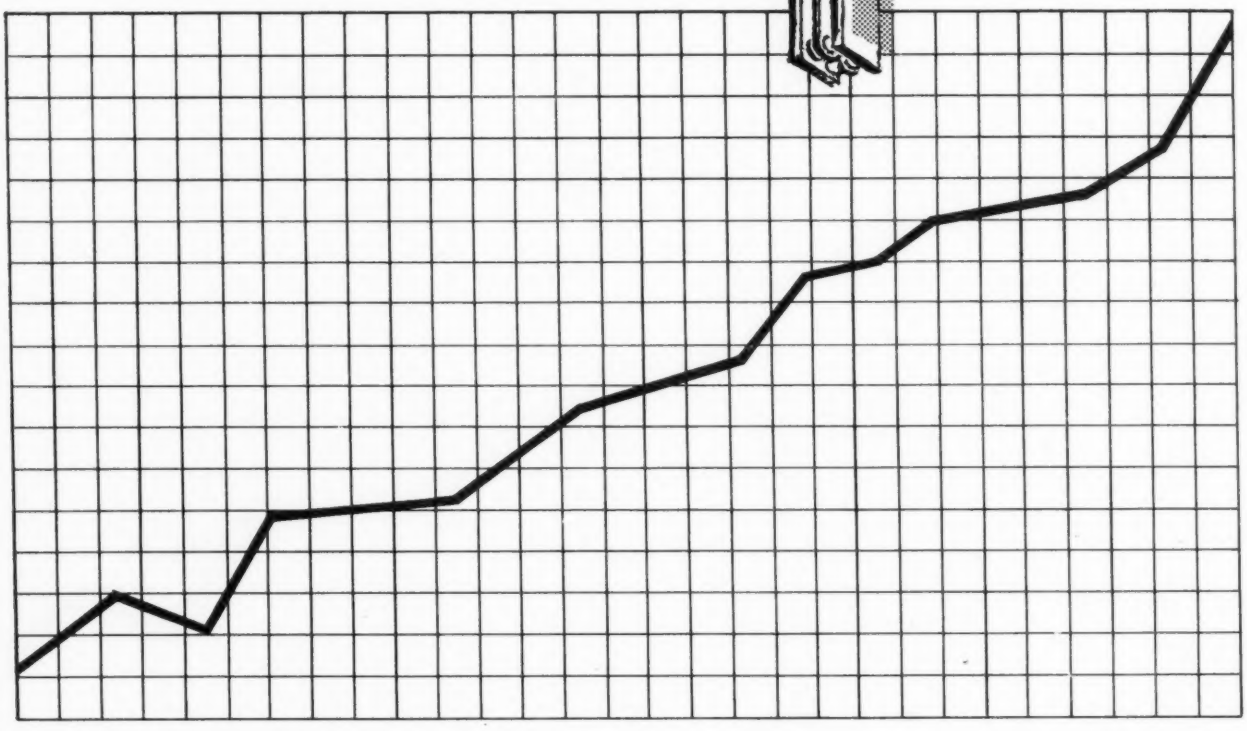
FALL RURAL ISSUE

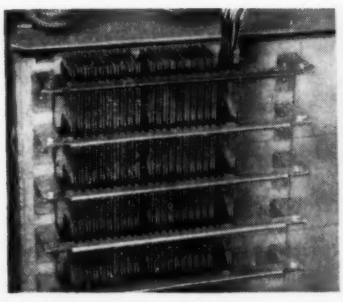
MANAGEMENT • PLANT • TRAFFIC • COMMERCIAL • LEGAL • ACCOUNTING

XUM

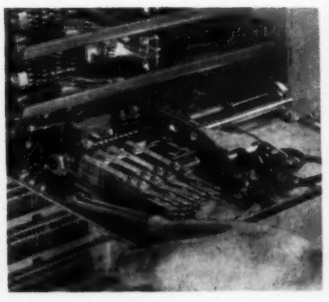
2×1=22.7

Like to fit thi





Vertical multiple wire bank units of nickel silver wire are part of every XY Dial System. They stay dust-free.



Famous XY Universal Switch slips into position as a finder, selector or connector in seconds, without alterations.

Wipers have twin conta… more effective operati… last years without repla…

hequation into your profit chart?

No matter how busy your central office operation may be, you get positive insurance of reliable operation and long life with *welded* twin contacts of precious metal—*22.7 times as reliable* as single contacts.

This money-saving feature is only one of many profitable advantages you enjoy with XY® dial equipment. For example:

Switch wipers have twin contacts for positive action and are designed to last for years and years . . . without replacement.

The renowned XY Universal Switch can be used as a *finder*, *selector* or *connector*—without alterations. It's easy to install, remove, adjust or clean.

Vertical multiple wire bank units save cleaning costs because *dust doesn't collect on the wires.* And you save on maintenance because dust-free wires insure noise-free circuits day in and day out.

Back-to-back rack mounting *saves costly floor space in building or expanding your exchange* . . . provides easy servicing and expansion of the system, while saving hundreds of dollars in building and space costs.

Your nearest Stromberg-Carlson representative will be glad to show you in full detail how profitably an XY System will fit into your dial plans.

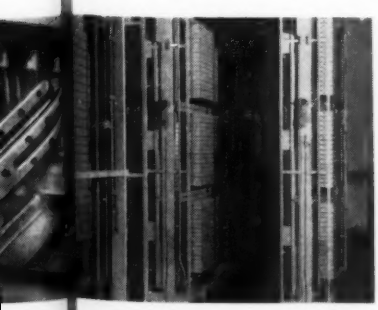
S-C

STROMBERG-CARLSON

A DIVISION OF GENERAL DYNAMICS CORPORATION

Sales Offices: Atlanta 6, Chicago 6, Kansas City 8, Rochester 3, San Francisco

GD



pment racks are mounted back to to save costly floor space in build- or expanding exchange. Servicing expansion of system are easy and pensive.

LEICH SALES CORPORATION

427 W. RANDOLPH ST., CHICAGO 6, ILL.

Southwest: 1227 Slocum Street, Dallas 7, Texas

Pacific Coast: 11401 West Pico Blvd., West Los Angeles 64, Calif.

LEICH

Date

No.

BILL TO Home Co-OP Telephone Co.

ADDRESS 129 Green St.

CITY and STATE Apple Valley, Wisc

SHIP TO (SAME)

ADDRESS

CITY and STATE

VIA

Please send us the following telephone supplies:

Leave Blank	Quantity	Cat. No.	Description	Price	Total
	2	T-25	Arrow Staple Gun		
	1	E-40-L	Estwing Hammer		
	2	301-6	Klein's Long Nose Pliers		
	100	8706	Machine Bolts		
	200	1085	Round Washers		
	200	1-102D	Wico Press Sleeves		
	5	901	Reliable Fuseless Station Protector		
	10,000 Ft.	NE-182 PECW	Alphaduct Dropwire		
	2 Rolls	410	Cable Splicers Muslin Tape		
	3	P-211	1 Lb. Cakes of Paraffin		
	1 case	650	ProteK-Sorb Desiccant		
	6000 Ft.	6RDT-19	6PR-19GA Rural Distribution Wire		
	3	5505	6 PR Reliable Terminals (For A		
	1	DCR-1	Electronic Secretary		

Signed Joe O

Thank you for the order

LEICH

A MEMBER OF THE GENERAL TELEPHONE SYSTEM — ONE OF AMERICA'S GREA COMMUNICATIONS SYSTE

EV

XUM

ERYTHING

YOU NEED YOU CAN OBTAIN FROM LEICH

What'll it be? Supplies, construction material or telephone equipment — Leich can take care of all your needs!

We're proud of the products we sell—products from famous manufacturers long acquainted with the demands of the independent telephone industry. Here are supply items made from the finest materials available—made to meet the high standards of the industry. Each has been proved-in-service and each is fully guaranteed by Leich to withstand years of hard use.

You'll like our service too—whether your order is large or small, it will be taken care of—and delivered where and when you want it. In every instance too, Leich's prices will meet approval with your supply budget!

Next time you need supplies, try Leich. We're sure you'll join the long list of telephone folks we call, "our happy customers!"

EICH SALES CORPORATION, 427 WEST RANDOLPH STREET, CHICAGO 6, ILLINOIS

IFIC COAST: 11401 WEST PICO BLVD., LOS ANGELES 64, CALIFORNIA SOUTHWEST: 1227 SLOCUM STREET, DALLAS 7, TEXAS

anufacturers of telephones, switchboards and related apparatus since 1907

If we put a midget operator

XUM

r in the control box –

If you put a midget operator in the control box of your key system you might be able to match the service you get from your K1A1 system. But you would have a busy midget. Here are a few of the things she would have to do, and do efficiently and tirelessly.

She would have to handle up to 4 incoming lines. The K1A1 selects as many as 4 central office or PBX lines.

She would have to give intercommunication service. The K1A1 permits you to select any one of eight other key phones simply by dialing one digit.

She would have to hold calls. With the K1A1 you can hold one call while talking on another line. This permits every key telephone user complete operational control.

She would have to flash the illuminated buttons. With the K1A1, buttons flash on incoming calls and burn steadily when the handset is lifted . . . this prevents accidental interference by other users.

These are the features your subscribers get with the compact and easily operated K1A1 system. No wonder the 1A1 type system is the fastest selling key system in the country. You will find that the K1A1 is a truly profitable revenue producer. It is easy to install and it requires practically no maintenance.

KELLOGG
A DIVISION OF IT&T

KELLOGG SWITCHBOARD & SUPPLY COMPANY
A Division of International Telephone and Telegraph Corporation
6650 S. Cicero Ave., Chicago 38, Ill.

KELLOGG Branch Warehouses and Offices:

4501 Truman Road
Kansas City 1, Missouri
HUmboldt 3-7085

23 Broderick Road
Burlingame, California
OXford 7 5780

165 Prospect Street
Passaic, New Jersey
PRescott 9-3610

1555 West Fourth Street
Mansfield, Ohio
LAfayette 4-6511

1515 Turtle Creek Blvd.
Dallas 7, Texas
RIverside 7-5191

1594 Southland Circle, N.W.
Atlanta, Georgia
Sycamore 4-2441

Export Distributor:
International Standard
Electric Corp.
50 Church Street
New York 7, New York

NEW ADDRESSES:

5924 S. Pulaski Road
Chicago 29, Illinois
REliance 5-7740

6100 Excelsior Blvd.
Minneapolis 16, Minn.
WEst 9-6715-16

FLASHES AND PLUGS

YESTERYEAR. William Dorband Jr., an Illinois Bell Telephone Co. plant foreman who recently celebrated his 50th anniversary on the job, "made" the "Chicago Briefs" column in the *Chicago Daily News* recently, with some reminiscences about what he called the bicycle era of telephone repair service. When he started as a repairman half a century ago, Mr. Dorband remembers, the bicycle was the prime carrier, with the horse and buggy reserved for special situations.

The bike had a side use too, in those days, he recalls; to climb a pole, the repairman often "stood on the handlebars and shinnied up." Beside the number of his years of service, Mr. Dorband is notable also for his attendance record: he has missed fewer than 10 days work in his career.

•

PRECEDENT SHATTERED. A man in Bigfork, Mont., will never be convinced that "lightning never strikes twice." Within three minutes a telephone, a haystack and an open field, all within 100 feet of his home, were hit by lightning during a thunderstorm.

•

THE PERSONAL TOUCH. Entering into the spirit of celebration over Teletype Corp.'s 50th birthday, William V. Kahler, president of Illinois Bell Telephone Co., recently sent the following greetings to J. J. O'Brien, Teletype's president, using the celebrant's own equipment:

DEAR JAKE:

THIS IS THE FIRST BIRTHDAY GREETING I'VE EVER SENT BY TELETYPE. AND WHY NOT—IT'S EASY, FAST, DEPENDABLE AND PERSONAL.

WE AT ILLINOIS BELL WISH YOU A "HAPPY 50TH" AND ARE GLAD TO CLAIM YOU AS A BRIGHT STAR OF OUR BELL COMMUNICATIONS FAMILY.

BEST WISHES FOR A SUCCESSFUL FUTURE—AND MAY *YOUR* STAR MAKE SPUTNIK LOOK LIKE AN INK-BLOT.

CORDIALLY,
BILL KAHLER

President O'Brien *telephoned* his thanks to President Kahler for the birthday greetings.

•

CALLS IT A DAY. When Peter J. Acton, supervising construction foreman for the Southern New England Telephone Co. recently retired after 48 years of service, the *New London Day* captioned his picture:

"Phone Veteran Hangs Up."

CHANGE OF ADDRESS

Please notify your local postmaster and the Circulation Dept. of TELEPHONY of change of address. Change cannot be made without the old as well as the new address. Allow three weeks for change of address to become effective.

Telephony

THE JOURNAL OF THE TELEPHONE INDUSTRY
Since 1904

December 7, 1957

CONTENTS

IN THE NATION'S CAPITAL 19
By Francis X. Welch

MODERN TRENDS IN DESIGN OF CARRIER TELEPHONE EQUIPMENT 22
By B. R. Stachiewicz

INDEPENDENT FINANCING TODAY 25
By R. F. Hardy

DESIGN AND OPERATION OF SMALL COMPANIES—Part 8 28
By R. J. Pollock

TROUBLE CLEARING—THE HIGH SCHOOL GRADUATE—Part 60 40
By L. N. Martin

THE PLANT MAN'S NOTEBOOK 43
By Ray Blain

PLANT MAN'S QUIZ 44
By Ray Blain

DATA TRANSMISSION—Part 3 46
By Harold B. McKay

TELEPHONY'S TRAFFIC ENGINEERING HANDBOOK 50
By Gilbert R. Brackett

THE OPERATOR'S CORNER 56
By Mayme Workman

COURTS AND COMMISSIONS 64

NEWS ON NEW PRODUCTS 92

H. D. FARGO JR., *President and Director of Advertising* • A. J. STULTS, *Vice President and Advertising Manager* • R. C. RENO, *Vice President and Editor* • DAN S. FARGO, *Vice President and Managing Editor* • FRANCES E. CRETCHER, *Associate Editor* • FRANCIS X. WELCH, *Washington Editor* • RAY BLAIN, *Technical Editorial Director* • HAROLD B. McKAY, *Electronics Editor* • MAYME WORKMAN, *Traffic Editor* • VIVIAN RYDEN, *Circulation Manager.*

VAC VERIFIED AUDIT CIRCULATION

Published every week on Saturday by TELEPHONY PUBLISHING CORP., 608 S. Dearborn St., Chicago 5, Ill. Entered as second class matter at the Post Office at Chicago, Ill., under the act of Mar. 3, 1879. 25c per copy (except special issues—40c). Subscription $4.00, 1-year; $6.50, 2-years; $8.50, 3-years. Add $1.00 per year for postage to Canada and Pan American countries; $2.00 per year to Foreign countries. Telephone WAbash 2-2435.

XUM

UNRESTRICTED RANGE OF VOLTAGE AND CURRENT RATINGS

- **no routine maintenance**
- **light weight, portable**
- **mounts in any position**
- **not damaged by freezing**
- **non-corrosive**
- **obtainable in any size**

Now available in all sizes, Lorain Dry CEMF Cells eliminate the maintenance problems associated with liquid-filled cells. Their light weight, portability, safety, and their unrestricted range of voltage and current ratings also adapt them for use as voltage regulating elements in many applications in which wet cells could not be used. They do not give off gases, do not employ liquids, are relatively insensitive to shock, and do not require maintenance or periodic attention. Lorain Dry CEMF Cells, therefore, can be installed wherever most convenient, making possible considerable economies in wiring, mounting racks, and floor space

Lorain Dry CEMF Cells are selenium covered metal plates, specially treated so their internal resistance decreases rapidly as the current flow through them increases, making them effective as voltage regulators. The amount of voltage drop is determined by the number of plates connected in series. Bulletin 176 lists representative sizes; assemblies to meet individual specifications are readily made to order. Specific recommendations will be made upon receipt of the current and voltage limits to be met, and the preferred mounting arrangement.

POWER EQUIPMENT FOR COMMUNICATIONS AND INDUSTRY

our equipment is sold through leading telephone distributors

FLOTROL PARTNERS IN DEPENDABILITY SUB-CYCLE

LORAIN *Products Corporation*

1122 F Street Lorain, Ohio Phone: ATlantic 8-9191

pp
9

for you

Yes, "It's for you", a progressive

Independent Telephone Company, and for your subscribers.

The exciting new NORTH Ericofon is available

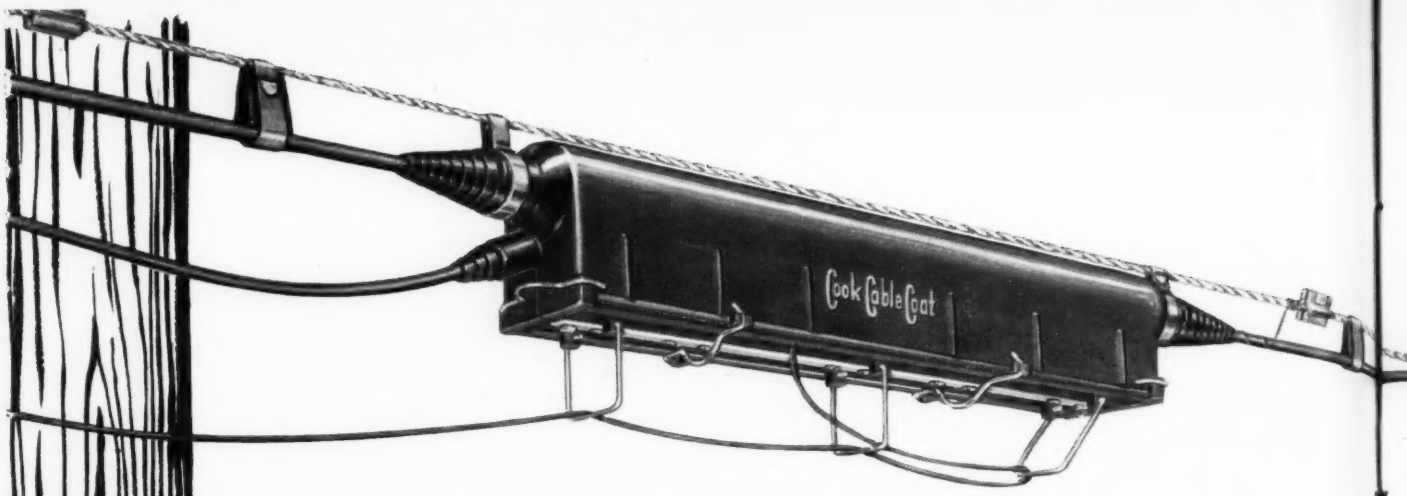
now—in six beautiful colors—Red, Ivory, Green,

Blue, Light Gray, and Dark Gray.

The ERICOFON is sold exclusively by NORTH.

NORTH ELECTRIC COMPANY

601 SOUTH MARKET STREET • GALION, OHIO

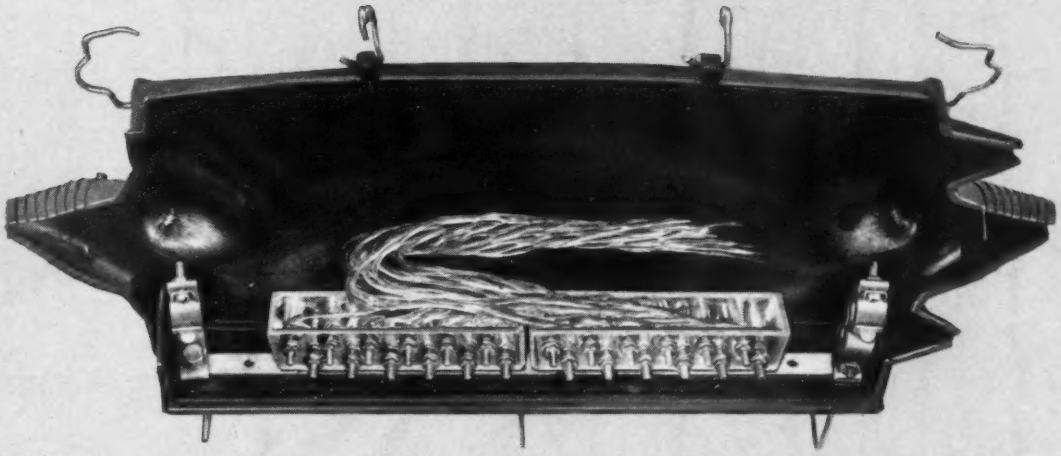


Not Copied But
DESIGNED FOR
INDEPENDENT TELEPHONE INSTALLATION

VERSATILE, ACCESSIBLE, EASY TO INSTALL

The Cook Cable Coat eliminates the need for:

Taped Splices:	flexible neoprene coat covers the splice area completely, can be opened and reached without damage, at any time.
Potting:	terminal blocks are filled with plastic resin and furnished with stud jumper wires for making cable conductor taps which eliminates the need for cutting and splicing the cable when taking off subscriber pairs. Connections are made by tapping onto the specified skinned conductors.
Optional Protection:	by using protected terminal blocks, Minigap selective pair protection is provided adjacent to the conductor stud, thereby eliminating the need to jumper to a pole mounted protector.



PROTECTED OR UNPROTECTED

Protected Terminal blocks available as well as unprotected. Selective pair protection is provided with either the Cook Minigap or Mytigap Arresters. Protected Terminals available in 6, 12, and 16 pr. sizes; unprotected in 6, 12, 14, 16, 18, and full count of 26 pr. sizes.

OPTIONAL AUXILIARY NOZZLE

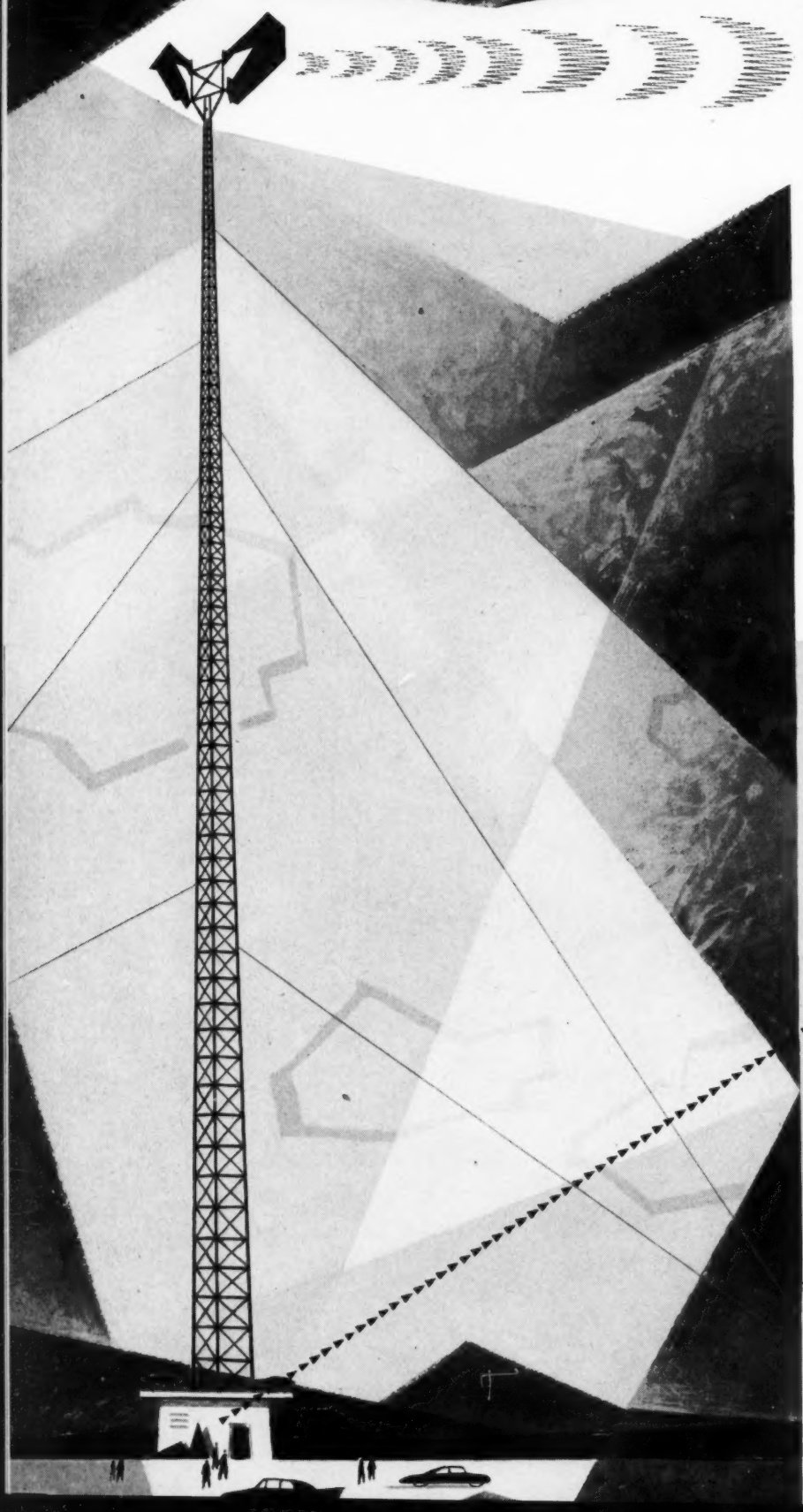
The auxiliary nozzle allows for either *wye* branch or terminal splicing, thus increasing the versatility and practicality of the new Cook Cable Coat.

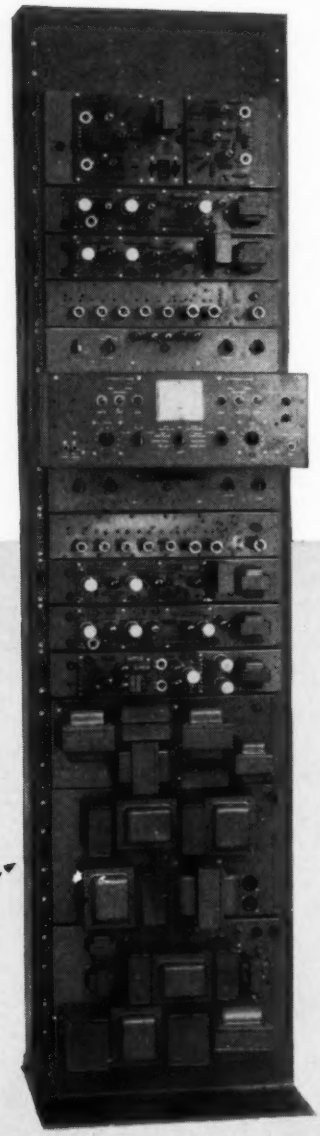
COOK ELECTRIC Company
Since 1897

2700 SOUTHPORT AVENUE CHICAGO 14, ILLINOIS

PHILCO *Announces*

NEW CLR-9 HIGH C





The CLR-9 terminal (shown with covers removed) consists of wave-guide and preamplifier, IF assembly, baseband drop, modulator, reflector control, servo, master control and tubeless power supplies.

HIGH CHANNEL DENSITY MICROWAVE

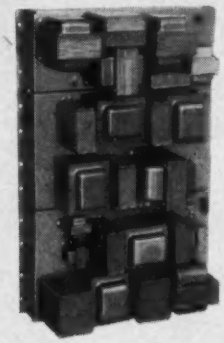
WITH 240 VOICE CHANNEL CAPACITY

Here is high channel density and outstanding reliability of operation—plus individual Automatic Standby for transmitter and receiver. The new Philco CLR-9 Microwave System is designed for quick installation in standard relay racks . . . and engineered with built-in metering and accessibility to all critical test points for easy field maintenance.

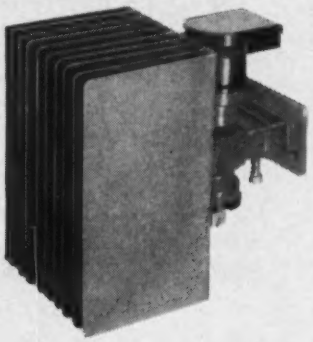
Performance reliability is sharply increased by the use of tubeless power supplies—new semiconductor rectifiers replace tubes. The use of printed wiring panels increases circuit stability—printed circuitry is keyed for easy identification—may be quickly replaced by maintenance personnel (permits efficient, centralized depot maintenance). Klystrons in the new CLR-9 are cooled by convection . . . the use of more compact heat sinks eliminates the need for bulky blowers.

The CLR-9's 240 voice channel capability is maintained even in repeater operation, to provide full duplex transmission and reception in both directions. Integrally mounted standby equipment is included.

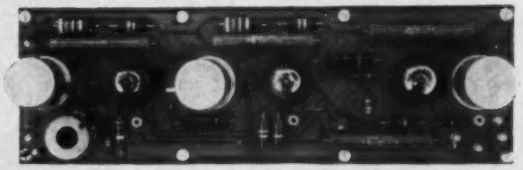
- **A new dimension in communications reliability . . . for continuous unattended operation.**
- **Baseband capacity for 240 channels or more.**
- **Peak performance at moderate cost—power supply capacity sufficient to accommodate both primary and standby equipment.**
- **Duplex transmission of wideband composite multiplex voice signals.**
- **Incorporates new low noise conversion and preamplifier circuitry.**
- **Integrated, fast, automatic standby selection included in one rack with individual back-up for transmitter and receiver functions.**



Heavy-duty, tubeless power supplies increase reliability by employing semiconductor rectifiers—assures minimum maintenance and very moderate operating cost.



Heat sinks cool the Klystrons by convection—compact CLR-9 needs no bulky blower system.



Rugged printed wiring panels increase circuit stability—easy identification simplifies maintenance.

PHILCO®

Government & Industrial Division

Philadelphia 44, Pennsylvania

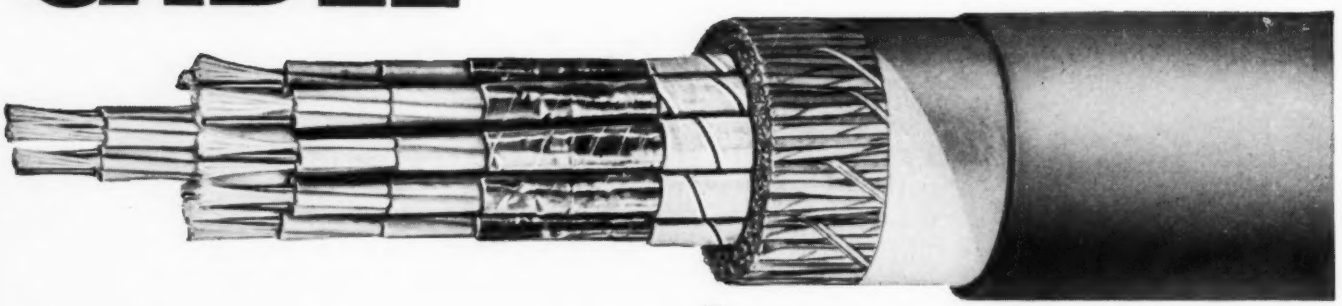
In Canada: Philco Corporation of Canada Limited, Don Mills, Ontario

XUM

NOW FROM GENERAL CABLE

UNIVERSAL FREQUENCY-RANGE CABLE

TO COVER PRESENT DAY COMMUNICATION SPECTRUM



VIDEO PAIR

Balanced broad band transmission circuits* for video and carrier—closed circuit TV—links to microwave stations —remote TV pickup—digital data transmission.

*Low signal to noise ratio
*Low attenuation
*Low shield resistance
*Low noise and cross talk levels
*Small phase distortion
*Low echo suppression

VOICE AND CARRIER

Telephone circuits.

SHEATH

Aluminum Lead
Stalpeth Alpeth
for aerial or duct installation

Also available with armor for direct earth burial or submarine use.

Distributed through:
AUTOMATIC ELECTRIC SALES CORPORATION
Northlake, Illinois
LEICH SALES CORPORATION
Chicago, Illinois

GENERAL CABLE CORPORATION,
420 Lexington Avenue, New York 17, N.Y.
Offices and Distributing Centers Coast-to-Coast

for quality and service... specify **GENERAL CABLE**

XUM

Here's what happened when the Ashtabula Telephone Co. changed to Recordak Toll Billing

BILLING an average of 70,000 toll calls a month to its 11,000 subscribers was becoming more and more of a bookkeeping problem! *How could microfilming help?* A Recordak Reliant Microfilmer was installed which microfilms up to 400 items per minute — results were immediate.

Toll tickets microfilmed at a 400-per-minute clip!

Now, toll tickets are photographed . . . no need to show individual items on bill . . . instead, toll tickets are attached to a statement showing total charges . . . then, sent on to customers as bill.

Reaction is 100% favorable

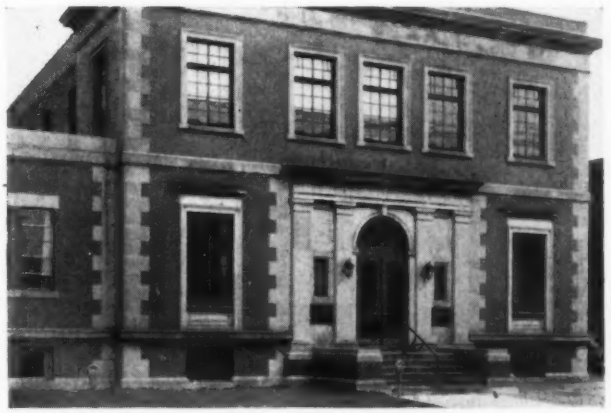
Commercial subscribers find they can allocate costs much more easily with toll tickets in hand.

Home subscribers—and especially those with teenagers in the family—are all for it, too. It takes the "mystery" out of telephone charges.

So much for good will — how about savings? Doing away with a description of each toll call on bill has brought an immediate 45% reduction in posting time . . . *that's a $4,000 a year saving!*

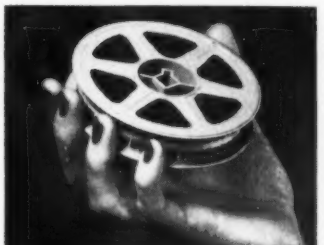
Bills now take half the time to prepare!

Saves in other ways—record of checks for daily bank deposit is made by microfilming the checks



The Ashtabula Telephone Company, Ashtabula, Ohio

. . . what was a 90-minute job now takes 15 minutes! Putting other office records on microfilm, like customers' service record cards, also saves much valuable vault and storage space.



Many thousands of customers' service record cards filed on one roll of film!

More than 300 telephone companies use Recordak Photographic Billing. You can, too! —regardless of the size of your company. Prices start at a low $550 for the Recordak Junior Microfilmer; also available on a low-cost rental plan.

"Recordak" is a trademark

Price quoted subject to change without notice

RECORDAK

(Subsidiary of Eastman Kodak Company)

Originator of modern microfilming—
now in its 30th year

MAIL COUPON TODAY

RECORDAK CORPORATION
415 Madison Avenue, New York 17, N. Y.

Gentlemen: Please send me more information on The Recordak Toll Billing System. CC-12

Name_____

Position_____

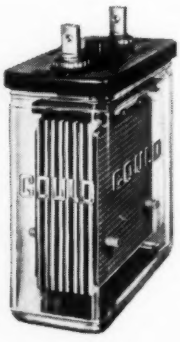
Company_____

Street_____

City_____ State_____

DEPARTMENT OF TECHNOLOGY
BUFFALO AND ERIE COUNTY PUBLIC LIBRARY

PLAY SAFE... buy the battery that gives you "extra runs" every year.



America's Finest!
GOULD PLANTÉ
The Aristocrat of
Stationary Batteries

Gould application engineers provide you with a continuing service that helps you keep batteries running longer. Try us and see.

Gould-National Batteries, Inc., Trenton 7, N. J.

More Power to you from Gould

gould
BATTERIES

©1957 Gould-National Batteries, Inc.

Always Use Gould-National Automobile & Truck Batteries

IN THE NATION'S CAPITAL

BY FRANCIS X. WELCH, WASHINGTON EDITOR

Analyzes effects of regulatory commission's assuming a hypothetical debt ratio when company is deemed to have too high a proporation of equity or stock capital. Says it understates actual cost of money and assumes lower-than-actual income tax liability.

CONSISTENCY has been called a rare jewel. And that is certainly true in the field of public utility rate regulation. For several years now a number of the state regulatory commissions have arrogated to themselves the power of assuming that they know better than public utility management how much debt that utility company ought to incur. More than that, they proceed to fix the utility's allowable rate of return on the basis of a purely fictitious assumption that the public utility company (whose rates are being passed upon) has incurred the amount of debt which that regulatory commission, in its wisdom, has decided *should have been incurred!*

It must be said that some strict state commissions—notably, the New York Public Service Commission—have steadfastly refused to resort to such hocus-pocus, in order to justify a lower return allowance than would otherwise appear to be justified.

But those state commissions which do follow this practice, also follow the theory that a utility company which can borrow money on bonds at less cost than it can raise new equity capital through the issuance of stock, ought to borrow as much money on bonds as it can, at the lower rate of interest. And if the company did not see fit to go into debt to that extent, but (instead) preferred to raise new capital through higher-priced stock financing, then the regulatory commission—acting as a sort of super-board of directors with the advantage of hindsight—penalizes the company for an assumed difference in the lower cost of capital which might have been incurred, as compared with the higher cost of capital which actually was incurred. When this cost of capital is translated into the allowable rate of return, the utility company is shortchanged in its rate structure.

There are two main arguments in favor of this practice of hypothecating an imaginary debt ratio. One is that the courts—in those states where the practice is followed—have not interfered. For various reasons—such as the "end result" rule, under which courts refuse to pass on formulas or methods used by presumably expert commissions—some state courts have gone along with this practice, or have at least permitted it to continue.

The other reason is the assumption that a utility company's management has some sort of duty to make the best bargains and the most economical arrangements in favor of the ratepayer, as judged by the infallible light of hindsight judgment.

In the case of Bell System companies it has also been urged that debt ratio hypothecation is justified by the fact that the financing of system companies is not done in the open competitive money markets, but is controlled by the parent holding company.

Some plain words on this practice were recently uttered in a dissenting opinion by Maurice E. Hunt of the Michigan Public Service Commission. This Michigan Bell Telephone Co. case was decided last August. It was the last official act of Commissioner Hunt; and he served notice at that time that he would enter a dissenting opinion, which was later released. Because it was his "swan song," Hunt's expression of his views was probably less inhibited than might otherwise have been the case.

The majority opinion of the Michigan commission assumed a hypothetical debt ratio of 40 per cent, rather than the actual Bell System debt ratio of about one-third. Hunt thought the majority was in error "in substituting its judgment for that of the company's experienced financial officers."

There was no evidence before the commission that one-third debt ratio, which the Bell System management had adopted was *unreasonable*. There was, on the contrary, testimony by a company witness that a one-third debt ratio is wise, and that a higher ratio would be unwise.

It was pointed out that when the debt ratio had exceeded 40 per cent in the past, the Bell System credit rating had declined. Even the commission's own staff witness had testified that one-third debt ratio was reasonable, although the staff witness said he thought that 40 per cent debt ratio was also reasonable.

On this basis, can it be said that a telephone company's management is abusing its discretion, when it prefers one of two admittedly reasonable alternatives?

The recent behavior of the bond market and the experience of other Bell System companies in selling bonds at much higher rates of interest, would indicate that there is considerable risk in trying to assume what the cost of

REA Approves Five Loans Totaling $1,025,000

Rural telephone loans totaling $1,025,000 were approved during the week of Nov. 18 by the Rural Electrification Administration for borrowers in Georgia, Maine, North Dakota, Oklahoma and Texas, the U. S. Department of Agriculture has announced. Initial service for 1,035 rural subscribers and improved service for more than 900 others are scheduled under the loans.

Hebron's Home Telephone Co., Hebron, Me.; $27,000 (Nov. 18).

The present and previous REA loans approved for the borrower, totaling $199,000, will finance dial service for 364 rural subscribers over 83 miles of line in Androscoggin and Oxford counties. The two exchanges at Hebron and North Norway have been cut over and now serve approximately 325 subscribers.

A. W. Morgan is president and manager of the Hebron company.

•

Totah Telephone Co., Ochelata, Okla., $128,000 Nov. 18, second loan, to finance initial service for 74 farm families and improved service for 111 present subscribers.

The subscribers now receive magneto service over 40 miles of line from the Burbank Telephone Co., whose facilities the borrower proposes to acquire. The borrower also plans to acquire 13 miles of line in the Burbank area from an oil company and use the poles, in place, for exchange line to serve the company which will become a subscriber. New facilities scheduled in the Burbank area include an automatic central office.

The present and a previous loan totaling $321,000 will enable the borrower to provide new and improved service to 624 rural subscribers. The completed system will consist of three exchange areas. The borrower expects to cut over its Ochelata and the Talala exchanges to automatic operation by the end of December.

Ernith R. Gailey is president and manager of the Totah company.

•

United Telephone Mutual Aid Corp., Langdon, N. D.; $514,000, fourth REA loan (Nov. 20).

The cooperative plans to use the loan funds to provide initial service to 388 rural families and improved service to 467 existing subscribers, including 43 switchers.

Existing subscribers now receive magneto service from the Shepard Telephone Co., which the borrower plans to acquire with loan and equity funds. This company consists of non-contiguous exchanges at Munich and Walhalla. The borrower also proposes to acquire the Rose Hill Telephone Co., owned by the 43 switchers near the Munich exchange. New automatic central offices are scheduled at Munich and Walhalla.

The present and previous REA loans to the borrower, totaling $1,852,000, will finance new and improved service to 2,692 rural subscribers and 22 switchers.

Francis G. Kitsch is president and Frank Solberg is manager of the United Telephone Mutual Aid Corp.

•

Keller (Tex.) Telephone Co.; $208,000 (Nov. 20).

The new borrower plans to use the loan funds to furnish initial service to 217 rural families in its area and improved service for its 338 existing subscribers. The borrower's present system consists of an automatic exchange at Keller and magneto facilities at Coppell.

An automatic central office building is scheduled at Coppell; the Keller central office equipment will be used in the expanded system and the building will be enlarged.

A portion of the loan will cover indebtedness incurred by the borrower in modernizing the Keller exchange and purchasing an automatic switchboard for the Coppell exchange area.

John L. Lamkin is president and manager of the Keller Telephone Co.

•

Ellijay (Ga.) Telephone Co.; $148,000 loan (Nov. 21).

The borrower proposes to use the loan funds to provide facilities to serve 356 farm families and others in the area who were not included in prior loans, to increase its proportion of private and semi-private lines, and to complete its authorized system.

The present and previous REA loans to the borrower, totaling $543,000, will finance new and improved service to 1,141 rural subscribers. The completed system will include automatic exchanges at Ellijay and Whitestone.

S. B. Green is president and manager of the Ellijay company.

debt capital is going to be, or what the cost of capital generally is going to be, if the debt structure is substantially increased.

Commissioner Hunt said: "Since all the evidence in the record is that the actual debt ratio is reasonable, I do not believe we have the power to substitute a hypothetical ratio of our own choosing. But even if the commission had the power, I would not substitute my judgment for that of experienced and capable financial management without a strong and convincing showing of error by that management, which is wholly lacking here."

The Double Penalty of Debt Hypothecation

This practice of assuming a fictitious debt ratio in order to justify a lower theoretical cost of capital imposes a double penalty on the owners of a regulated public utility.

First, it understates the cost of money, as compared with its actual cost, in determining the allowable rate of return.

Secondly, it assumes a lower income tax liability than the regulated company actually incurs.

Commissioner Hunt said on this second point:

"Because interest is a deductible item for income tax purposes, any change in the amount of debt will likewise affect the income tax calculation.

"The debt ratio upon which the company's income tax adjustment was based is the actual debt ratio of the Bell System upon which taxes are actually paid. The benefit of this actual debt ratio has simply been allocated to the Michigan company, and to its ratepayers.

"It is misleading to say, as the majority opinion does, that both the company and the staff have proposed

hypothetical debt ratios, and that the commission is therefore free to select any ratio it finds reasonable. It is wholly different, and I believe contrary to law, to calculate taxes upon a debt ratio which does not exist and will not be attained.

"The majority, in using a 40 per cent debt ratio, is disallowing an expense which cannot be avoided, and which no testimony has shown to be unreasonable."

What about tax depreciation?

Consistency becomes a rare jewel when we consider what some of these same regulatory commissions do about determining a public utility's income tax liability as a result of accelerated tax depreciation. Sometimes the same regulatory commission which says that a public utility company must be assumed to have paid a *lower* income tax than it actually paid, for purposes of hypothecating debt ratio, will take an entirely contrary view in determining the public utility's tax expense as a result of the use of the accelerated depreciation deduction, allowed under the Internal Revenue Act of 1954.

Under that law all corporate businesses (not just public utilities) are permitted to assume a greater amount of depreciation in the earlier years of property life than would be the case if the deduction were spaced out in equal instalments over the entire life of the property.

Public utilities are permitted under the tax laws to take this larger deduction in order to reduce the income tax liability. But when a public utility does this, it finds that the temporary benefits can be obtained (in the form of additional net revenues) only if it is assumed, for the purposes of operating expenses, that the taxes were paid on the old basis of equal annual depreciation accruals.

But when some of the public utilities sought to use a so-called "normalized" income tax expense, several state commissions raised their hands in protest. They could not allow this, they said.

Public utilities would be allowed to charge as operating expenses only the amount of taxes actually paid. They would not be allowed to enjoy the differences—even temporarily—between a tax theoretically paid on one basis (normalized) but actually paid on a lower basis.

What is the difference, in principle, between assuming a theoretical tax for purposes of depreciation, and assuming a theoretical tax for purposes of debt hypothecation? Why is it wrong for the utility company to follow the first method, and right for a regulatory commission to follow the second course? Consistency surely is a rare jewel.

1958 Convention Calendar

Association	*Date*	*City*	*Hotel*
Louisiana	Feb. 12 and 13	New Orleans	Jung
Minnesota	Feb. 17, 18 and 19	St. Paul	St. Paul
Texas	March 3 and 4	Dallas	Baker
Kentucky	March 4	Lexington	Phoenix
Iowa	April 8 and 9	Des Moines	Fort Des Moines
Ohio	April 14, 15 and 16	Columbus	Deshler-Hilton
Nebraska	April 22 and 23	Omaha	Paxton
Indiana	May 7 and 8	Indianapolis	Claypool
Wisconsin	May 14 and 15	(City and hotel unannounced)	
Illinois	May 21 and 22	Peoria	Pere Marquette
Kansas-Missouri*	May 26 and 27	Kansas City	Town House
Pennsylvania	May 26, 27 and 28	Bedford	Bedford Springs
Maine-New Hampshire-Vermont*	June 3, 4 and 5	Rockland, Maine	Samoset
California	June 4, 5 and 6	San Francisco	Sheraton-Palace
New York	June 16, 17 and 18	Schroon Lake	Scaroon Manor
Michigan	Sept. 9, 10 and 11	Grand Rapids	Pantlind
Rocky Mountain	Sept. 17, 18 and 19	Salt Lake City	Utah
USITA Annual convention)	Oct. 13, 14 and 15	Chicago	Conrad Hilton
Virginia	Oct. 30 and 31	Roanoke	Roanoke

*Joint Convention

As a matter of fact, there is more justification for a public utility company, seeking to "normalize" its tax accruals for purposes of accelerated depreciation treatment than there is for a regulatory commission to assume a lower tax liability—for operating expense purposes—in debt ratio hypothecation. This is because the so-called "tax savings" under the accelerated depreciation formula is not a real saving at all, but only a tax deferral.

During the later part of the life of the property, the depreciation deductions will become smaller and smaller so that, in the end, the same tax results (assuming the tax rates are not changed in the meantime) are accomplished. So whether the deduction is figured on an equal instalment (straight line) or on an accelerated depreciation basis, the utility company must pay the same amount of taxes in the end.

In the case of assuming a smaller tax liability for purposes of debt ratio hypothecation, however, there is no such eventual balancing out of results in favor of the utility company. The unallowed tax expense is lost, not only for the year it is not allowed, but also forever.

Furthermore, such a procedure poses a grave social problem in the form of possible subsidy of the ratepayers at the expense of the taxpayers. We all know that there are plenty of taxes to be paid, and if one taxpayer avoids, the other taxpayers must take up the slack.

Suppose, as a result of debt ratio hypothecation, public utility companies generally decide to go into debt—a lot of debt. Debt interest is deductible. So that means they pay less income taxes on the balance of earnings. Who else is going to pay *these taxes which were not paid?* If they had paid *more* income taxes (as a result of a lower debt ratio and a resulting higher income for stockholders), the U. S. Treasury would be that much better off.

What regulatory debt ratio hypothecation amounts to, then, is an incentive, if not an actual directive, by regulatory authority to the regulated utility company to avoid income tax liability —so that the ratepayer can get the benefit of such avoidance. This is something for the rest of us to think about, the next time we sit down to address ourselves to the painful duty of filling out Form 1040.

What Does Debt Hypothecation Cost in Earnings?

In the Michigan Bell case we have a good example of what this arbitrary debt hypothecation actually costs a telephone company in earnings available for dividends. The Michigan commission staff witness found the cost of all money to be 6.6 per cent, based on a theoretical debt ratio of one-third of outstanding capitalization. Commissioner Hunt rejected this figure, stating:

"First, it is based upon the actual interest cost of Bell System debt outstanding at Dec. 31, 1956. The witness testified (and the majority is surely well aware) that the present cost of debt capital is much higher.

"Allowing only for additional Bell System debt which had actually been issued at the time of the testimony, or which had been publicly announced, would raise the interest cost to 3.28 per cent, and there is no question but that it will continue to rise as debt issues are sold at higher costs.

(Please turn to page 88)

Modern Trends in Design of Carrier Telephone Equipment

By B. R. STACHIEWICZ*

MUCH HAS been written in various technical publications about different new carrier telephone systems which were designed and manufactured after World War II.

The design requirements of such systems are of necessity dictated by the ultimate application and usage of the equipment. There are, however, numerous ways in which such requirements can be met. The objective of this paper is to give a short survey of various approaches taken by design engineers in solving problems of equipment design applicable to wire line carrier systems operating in the frequency range up to 300 kc.

In general, the problem facing telephone engineers after World War II was to fulfill an overwhelming demand for more communication facilities. The result was to focus attention toward designing new carrier systems more adequate for modern use. Systems of older design had not proved economical when operated over short distances. In addition, they were bulky and consumed large amounts of power.

In order to accommodate more circuits, requirements arose for new telephone terminal equipment that could be operated over short links, could use frequencies that were always available (but for various reasons were considered unsatisfactory); and could be adapted to cable or radio operation when needed. Such new systems had to be more compact, easier to maintain, should consume less power and be relatively inexpensive.

It has often been said that present-day carrier telephone systems are only as good as the filters contained therein. To a large degree this is true. The use of filters permitted the separation of various speech bands after they were positioned in the frequency band by modulation. In this way, carrier telephony became a reality.

In 1948, a new invention, the transistor, was announced which was destined to cause a revolution in electronics. This little piece of germanium, had all of the amplifying properties, as well as the demands for ruggedness, low power requirements, small size and theoretically infinite life.

To the telephone engineer, the transistor presented far-reaching design possibilities; and recently when it was announced that a solar energy converter had been constructed, a field of almost unlimited scope was introduced as a forthcoming challenge to the younger generation.

New trends in both the electrical and mechanical approaches to carrier telephone system design appeared after World War II in the field of circuitry design, the use of components and in the methods of equipment packaging. Further improvements are constantly being made in these new techniques. Universal incorporation of printed circuitry and transistors appears to be the next logical step in this development. Throughout these new phases of advancement, as in the past, the prime considerations of the design engineer have been two-fold, namely; economical design, coupled with an efficient utilization of allocated frequency space.

B. R. STACHIEWICZ

Transmission Methods

To review these modern trends, let us consider some of the new approaches that were made in the field of basic system design. Reference to *Figure 1*, showing a block schematic of a typical four-channel system, will facilitate this discussion.

In recent years, practically all suitable methods of sideband transmission have been tried by designers of carrier equipment. Double sideband, single sideband suppressed carrier and twin channel methods of transmission are in existence. Although all of these methods have resulted in reliable operation, there are important differences in their application which affect the design and cost of the carrier equipment.

The single sideband, suppressed carrier transmission, which has been extensively used for some time, imposes, in general, a more severe requirement on the transmitting channel bandpass filters than do other methods. Also, a separate source of carrier frequency is required for each channel.

The double sideband transmission system, although normally easier and less expensive to design (a notable feature being the possibility of elimi-

*Mr. Stachiewicz is with the West Coast Telephone Co. of Everett, Wash., and formerly was Assistant Head, Carrier and Microwave Development Section, Telecommunication Engineering Department of Stromberg-Carlson Co.

nating the transmitting channel band filters), has a great disadvantage in requiring twice the frequency space per channel. Hence, fewer channels can be provided. This may be acceptable in cable applications where conductors are numerous, but on open wire systems this limitation of channels is prohibitive.

If carrier is transmitted with the sidebands, as is normally the case, a problem of power overloading of group amplifiers arises due to the presence of many high-power carrier tones. An interesting future possibility, in this respect, is the reduction of carrier, while transmitting the sidebands.

The twin channel method with its inherent problem of intelligible crosstalk between channels, generally requires more suppression in the channel filters at frequencies near the carrier. However, this method has some attractive economical and electrical advantages which merits the following comment:

In channels with a total bandwidth of 4 kc, carrier frequencies are located 8 kc apart, one carrier oscillator serving two channels. Thus, only half the usual number of carrier oscillators is required.

Due to the 8-kc separation between carrier frequencies, it is easier to eliminate any interference caused by demodulated carrier leaks. It is also easier to control phase delay characteristics of the channel filters, since steep suppression characteristic is only required at frequencies near the carrier.

The problem of third order interference arising in group modulators can also be reduced by proper choice of carrier frequencies.

Filter Design

This discussion indicates that the methods of transmission chosen have a direct effect on the design of channel band filters; probably the most critical units in the entire system. Normally, one such filter follows the transmitting modulator and one precedes the demodulator; necessitating two per channel. Their combined frequency response characteristic will, to a large degree, determine the over-all channel response; and their out-of-band suppression will determine the interchannel crosstalk interference.

The design of channel filters must also meet a multitude of other requirements. Because of the number used, they must be simple to manufacture and line up.

Some carrier systems provide arrangements for optional upper or lower

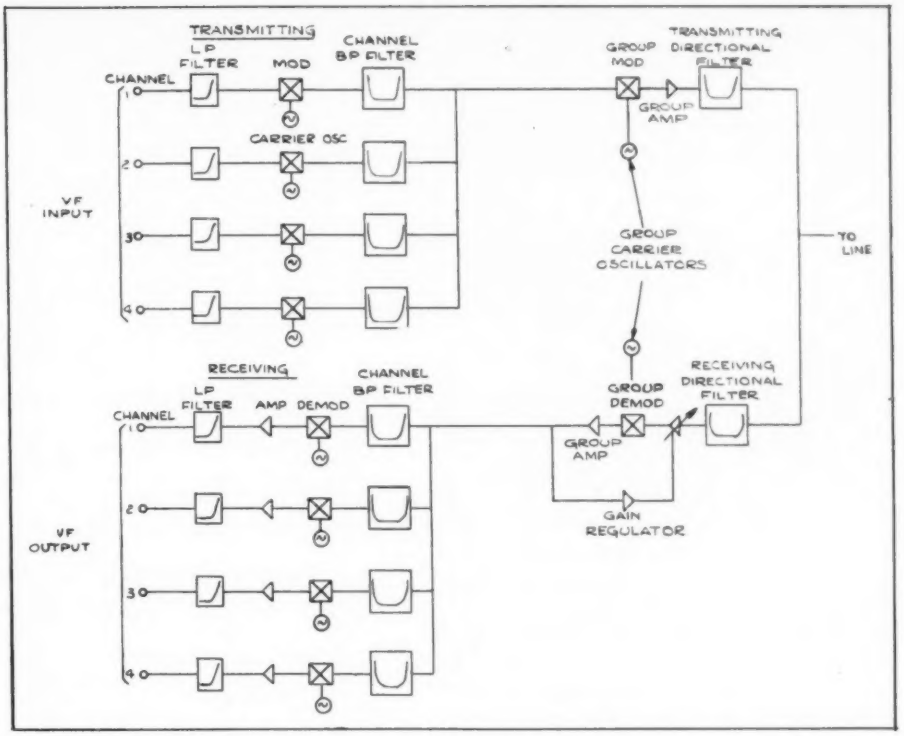


Fig. 1. Simplified block diagram of four-channel carrier terminal.

single sideband transmission. In such cases, since the attenuation requirements for band filters are inverse to each other, it is necessary to provide two designs for one channel; unless a symmetrical filter is constructed with adequate suppression for both applications. It is evident that such a filter will be more complicated and more costly to produce. Its use depends on the economics of the problem.

Should lower and upper sideband transmission be contemplated, as well as twin channel operation, 12 different filters must be designed. In addition, if operation with and without compandors is anticipated, theoretically 12 additional designs should be provided. As it is normally impracticable to design so many filters for one system, a compromise solution is often adopted resulting in one filter having adequate characteristics for several applications. Obviously, such a filter will be more expensive and complex, but reduction of the number of designs has other advantages which provide a counterbalance.

A prime consideration in filter design is the flatness of frequency response within the usable frequency band. Equalizers are often necessary to compensate for extra attenuation introduced near the cut off frequencies by component dissipation and impedance mismatches. At this point, it is pertinent to note that twin channel transmission will require the equalization of only one corner, resulting in appreciable cost reduction.

To a large degree, the out-of-band suppression requirements in transmitting band pass filters are dependent on the type of modulator used. Shunt modulators produce sidebands on second harmonics of the carrier only a few db below the fundamental sideband, which must be suppressed in the filter. The use of double-balanced modulators reduces such sidebands by approximately 25 db. However, the modulator requires an isolating transformer as one-side grounded operation is not possible.

Due to modulation products on harmonics of the carrier resulting in interchannel crosstalk, the trend is to use lower sideband transmission wherever possible. Among other things, this results in less filter design complexity.

Double sideband transmission also results in a great relaxation of requirements. Here, with the use of com pandor, the transmitting filters can sometimes be completely eliminated. However, this method is wasteful of frequency space and consequently not very popular.

One of the most recent requirements imposed on the design of channel band filters resulted from the application of commercial circuits for military automatic data transmission (SAGE). Such type of service requires that envelope time delay for frequencies within the pass band be closely controlled. This means that in addition to the control of attenuation, phase requirement is also imposed. In some cases it may be necessary to add delay equalizers to

existing systems to meet envelope delay specifications.

Compandors

In view of all the foregoing demands upon the design of channel band filters, it is not surprising that efforts were made to find other means by which out-of-band suppression requirements could be reduced. Probably the greatest benefit in the over-all relaxation of filter and system requirements came about when compandors were introduced as an integral part of the system. The noise and crosstalk advantage in the order of 20 to 30 db obtained from compandor action resulted in simplified circuitry and less expensive filters.

The compandor consists of two parts: The compressor and the expandor. The compressor is located in the voice path at the input to the transmitting channel modulator and the expandor in the voice path at the output of the receiving terminal.

The range of the incoming speech levels, which may vary up to 60 db is compressed in the compressor by a ratio of 2:1, resulting in a range of 30 db at the output. The action of the expandor is exactly opposite to that of the compressor. The compressed speech entering the unit is expanded by a ratio of 2:1 and thus restored to its original range.

It will be apparent from *Fig. 2* that the compressor action has the effect of raising the level of weak tones more than that of the strong ones. It becomes possible, therefore, for the weak tones to override any noise or interference existing on the line.

The expandor has the property of attenuating the weak tones more than the strong ones. Consequently, noise or crosstalk pick-up on the line is subjected to large attenuation in the expandor, during the absence of speech.

This attenuation is called "the compandor advantage" and can be subtracted from the out-of-band suppression requirements of the filters.

The application of compandors, although greatly beneficial to system performances, also presents certain disadvantages. One of the latter is the difficulty of operating telegraph and other pulse-type information through a compandor, and another is that level variations introduced in the system are doubled by the expandor.

On the other hand, the advantages are great. In previous years, difficulty was experienced in operating carrier telephone systems in the range up to 150 kc, due to high line attenuations caused by ice on conductors, and due to high static and lightning noise under wet weather conditions. Also, on leads transposed for 35 kc operation, although some pairs could be used for transmission up to 150 kc, crosstalk conditions were prohibitive at these frequencies.

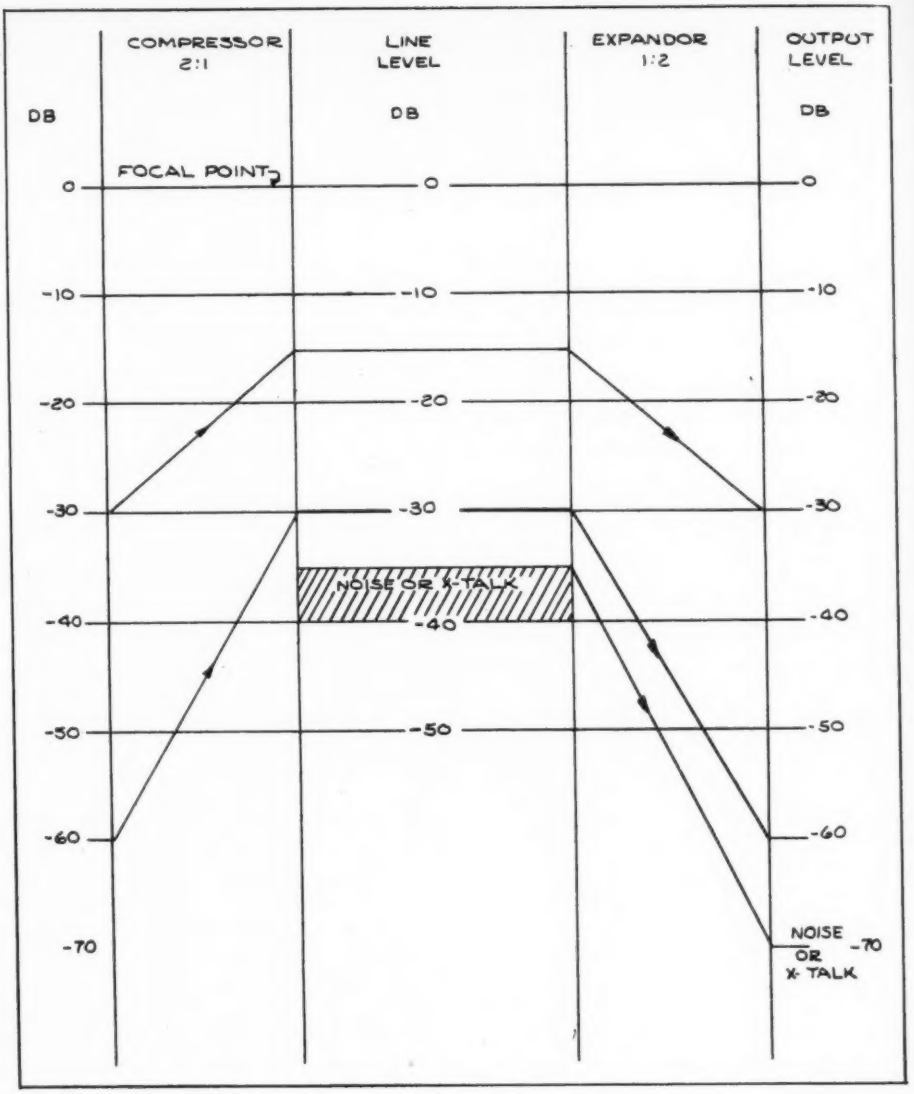


Fig. 2. Compandor action.

The application of compandors made it possible, in some cases, to transmit frequencies up to 150 kc over lines transposed for 35 kc, without the necessity of re-transposition. This resulted in a great saving of both time and money for the operating company.

New Applications

In recent years, the demand for more channels resulted in two definite trends in the planning of telephone systems. One was to introduce carrier operation between subscribers and the central office; the other to provide radio links wherever economical.

The design of subscriber carrier terminal, given impetus by the application of transistors, makes it possible to increase the capacity of a rural line by as many as 50 subscribers. This is done by adding five carrier channels to the existing physical circuit. In order to meet cost objectives, most modern manufacturing and automation techniques have to be used in production. The introduction of this type of system was a great stride towards completely new techniques in telephone engineering.

The next logical step in new uses of carrier seems to be the application of carrier to the exchange trunks.

The use of radio links as the transmission medium permits the application of 120 or more speech channels over one link. For short distances, and in view of overloaded wire facilities, this approach is increasing in popularity.

Today, we have systems providing 12 channels at frequencies up to 150 kc over open wire; cable systems of 24-channel capacity using frequencies up to 264 kc; and multiplexing arrangements furnishing 120 or more channels on radio links operating at various radio and microwave frequen-

(Please turn to page 68)

Independent Financing Today

By R. F. HARDY*

TO BETTER analyze what the financing picture is today, let us review briefly what has taken place in the field of financing Independent telephone companies in the recent past. We all know that following World War II this industry has been experiencing an unprecedented demand for service.

Our way of life and personal habits have changed to the point where we are, today, making more than twice as many calls as we did in 1945, and these calls are being completed many times faster than they were then. This demand, together with the change in the art of telephony experienced during that period, have given rise to a tremendous growth in plant facilities and an expenditure of enormous sums of money.

To illustrate this change, a few statistics might be of interest. In 1947, there were some 6,000-odd Independent telephone companies in this country, with a total plant investment of 750 million dollars, serving roughly 5.2 million telephones, of which 29 per cent were dial. By 1956, in less than 10 years, the number of companies had dropped to 4,400, but the plant investment had jumped to over 2.3 billion dollars with 9.1 million telephones in service, 69 per cent of which were dial.

The greater part of our postwar expansion took place in about the last seven years. Prior to that time, funds for any large-scale development of Independent telephone properties were not generally available. Banks and insurance companies were inclined to lend only to the system companies and a few of the larger truly Independents. Supplier financing plans and the REA telephone program were then only in their infancy. This retarded financial atmosphere was due primarily to the lack of understanding by leaders of the needs and potential of the industry, and a reluctance or a lack of interest on the part of the Independents to educate the financial world as to their needs and potential through advertising and personal contacts. In fact, so far as the general public, as well as investors, were concerned, the Independent telephone industry at that time was a virtual unknown.

Utility Financing Different

Commencing around 1950, several of the large city banks, particularly the Chase National Bank in New York City, and a few of the smaller insurance companies, became interested in helping the Independent industry, and about this same time manufacturers' finance plans and the REA began to build up a volume of loans to the smaller telephone companies. Since then, hundreds of millions of dollars have been invested in automatic conversions and expansion of facilities—dollars derived from bank loans, supplier financing, debt securities sold to institutional investors, and preferred and common stock sold to customers, employes and existing stockholders.

It should be pointed out that the financing of utilities, including telephone companies, differs considerably from the financing of industrial enterprises. The latter frequently can provide all, or a large part, of their capital requirements from cash generated by their own operations, whereas, in the case of utilities, this is not possible. This points up the importance of, and dependence upon, outside sources of capital for utility growth. Postwar telephones about doubled, the plant investment tripled, and they tell us we have not seen anything yet. Predictions are for 12 million Independent telephones by 1960, and 26 million by 1975. What will be the plant investment then? It could easily be 8 billion dollars or even 10 billion dollars. The mere size of the figures verifies the importance of financing in our future.

R. F. HARDY

Let us, at this point, differentiate between short-term and long-term financing. Short-term financing involves the temporary funds borrowed, usually from a commercial bank, to cover requirements during a construction period. By using short-term financing, a company can complete its construction program and have time to reflect in its financial statements the resulting savings in operating expenses and the higher rates which improved service would warrant before selling bonds and being required to make sinking fund payments. Furthermore, it is easier and more advantageous to sell bonds against demonstrated results rather than forecasts.

Short-term Is Flexible

Short-term financing is quite flexible. It can be more easily changed to provide for unforeseen expenditures arising from price changes, or changes in requirements, or as a result of delays in equipment deliveries, or miscalculations. Frequently, the cost and timing of a construction program at completion may be substantially different from that initially estimated.

Permanent, or long-term financing, is what the term implies—money borrowed over a long period of time, quite often for 20 to 25 years or more. The loan programs such as are offered by the suppliers and the REA provide both the construction period financing, as well as the long term.

The principal commercial sources of permanent debt financing are life insurance companies. More and more life insurance companies, coast to coast,

*Mr. Hardy is President of General Telephone Credit Co., a subsidiary of General Telephone Corp. He gave this address at the recent convention of the Virginia Independent Telephone Association.

have found the bonds and debentures of Independent telephone companies to be attractive investments. Each life insurance company, in purchasing securities, besides setting down its own particular standards, must meet certain basic requirements, including minimum interest coverage and maximum debt ratio, established by regulatory bodies having jurisdiction over its activities. Therefore, it is essential that the lender of the temporary construction funds be confident that the company will be able to meet those qualifications following completion of the project. These, then, set the pattern of requirements for construction loans.

The next consideration is—what are these requirements? The company must be a corporation organized for profit. This, general speaking, rules out mutuals and cooperatives as well as proprietorships and partnerships. The corporate form of organization is the most flexible and permits the issuance of securities. You may have observed that it is most often the mutuals and proprietorships that have not raised the necessary capital to modernize their facilities.

A second requirement is capable management. The officers and directors should constitute a nucleus of experienced business and professional people, including those well versed in modern telephony, who are capable of operating the company effectively and efficiently, enabling it to serve the public properly in all phases of its activities. Management must also have won the respect and confidence of the public it serves—which means having good public relations. It must be vigorous and young enough to assure the lender that the necessary construction will be carried to completion and a progressive program maintained.

Size of Borrower a Factor

Size of the prospective borrower is also an important factor for several reasons. The company must be large enough to attract and retain competent management and technicians in the face of competition from other sources of employment, and its financial requirements must be of a size sufficient to interest the long-term investors at completion of construction. Seldom has a company of a size requiring much less than $100,000 for a complete modernization program been able to interest an insurance company or, for that matter, the REA. For the very small company, supplier financing is often the best source of long-term capital.

The purpose for which a loan is to be used also has a bearing on whether or not it would be considered favorably. For example, a loan to merely patch up a broken-down plant is rarely given consideration. A loan must be for a sound constructive purpose, such as for new plant to provide improved service, service to more subscribers, or more economical operation, or sometimes to facilitate advantageous mergers or consolidations. A loan application must be backed by complete and well-engineered plans and cost estimates. Any project for which a loan is to be made must be complete within itself. It must accomplish at least one beneficial phase of the company's development. It must, however, be a project or projects which will not take too long to finish. Any program requiring more than 18 to 24 months to complete might better be subdivided for financing purposes.

It is frequently the case that a company cannot accomplish its entire improvement program solely with borrowed money, since to do so would give the lender too large an investment in the company in relation to the stockholders' equity. In such instances, equity securities must be sold usually prior to the initial borrowing.

The requirements already mentioned point to another very important aspect in the development and progress of a telephone company and that is the requirement of forward planning. It is impossible to carry out a sound financing program if the physical development and revenue requirements are not well thought out in advance.

Adequate Earnings a Must

Adequate earnings are a prerequisite to the sale of equity securities and long-term debt obligations, and, for that matter, most any form of financing. Investors usually require that interest on the company's debt be earned a minimum number of times over certain past years as well as at the time of purchase, or in the case of stock sales, that the earnings per share have been increasing steadily.

The importance of furnishing copies of earnings statements for prior years is not so much for providing a historical record as it is an indication of the caliber of management. You might think of the financial statement as the report card of school days, since it shows how management has handled its stewardship and the progress it has made in guiding the company. From this it is easy to understand the importance of always keeping earnings up to the permitted maximum, especially during years of heavy construction, since these years are most always followed by the sale of permanent securities. Most regulatory authorities are cognizant of the earnings required to support an improvement program and will approve adequate rates. However, companies must be awake to recognize the need for better rates and apply for them promptly.

While considering the matter of earnings and financial status, another requirement must not be overlooked, and that is proper accounting procedures and adequate financial statements. Any company, whether or not contemplating any future financing, should see that its books are in order and, by that, I mean that they conform to prescribed practices, and it should be borne in mind that lenders usually will require a periodic audit. Be sure that your accountants and auditors know and have had experience in telephone accounting. Likewise be sure the lawyer you select to assist in your financing and commission proceedings has had utility experience. Any additional cost required to get competent help in these fields is well worth the price.

Require Deposits

These comments on financing requirements have been generally applicable over the past several years, but right at present in this era of so-called tight money, there have been introduced certain additional, more restrictive conditions.

Most banks are now requiring that their borrowers shall have maintained deposit balances with the bank of minimum proportions for a reasonable period of time, sometimes as much as 20 per cent of funds needed for six months prior to the borrowing. This limits drastically the availability of bank funds for Independent use today, since few Independents keep sufficient cash on hand to carry such deposit balances. Some banks may be a little more liberal, in that they only require the borrower to open an account with them and agree to maintain substantial sums on deposit in the future.

These methods of allocating limited loanable funds just to depositors is fair and conforms to bank practice in previous tight money periods. After all, without deposits, a bank would have no funds to lend. What does this mean to the small utility? It means that, unless you have historically kept deposits in a large city bank, your chances of obtaining financial assistance from them today is slim. It also means that you should keep the bank where you now have your funds even better informed as to the nature of your business, its prospects, and its financial needs in the hope that they will help to the extent they are able. As a matter of fact, it is your local banker who can give you your best introduction to a large city bank.

(Please turn to page 78)

ACME VISIBLE

UNDER-GLASS BULLETIN HOLDER

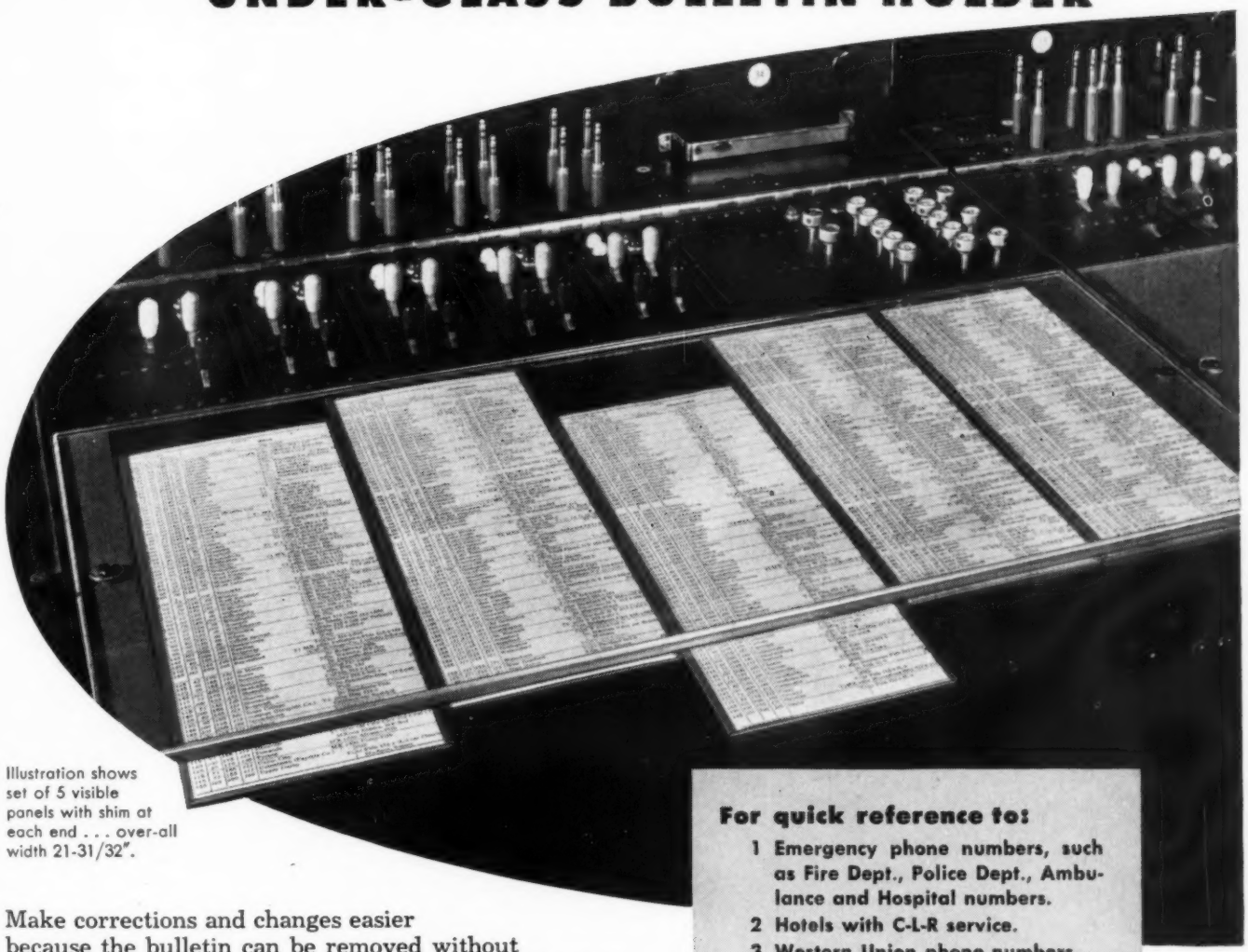


Illustration shows set of 5 visible panels with shim at each end . . . over-all width 21-31/32".

Make corrections and changes easier because the bulletin can be removed without loosening the glass. Being divided into a number of panels only the panel (page) to be corrected need be removed. One piece steel construction, flanged at back and side edges to hold the bulletin in place. The front edge is formed to provide a "pull" to slide panel out. A shim at each end panel makes the over-all width the same as the Bulletin Glass space. Shims are slightly thicker than panels and have a slot through which the Plexiglass screws hold the glass firmly, and permit sliding the individual panels in and out. Made to meet dimensional requirements both as to individual panels and over-all size of boards.

For quick reference to:

1. **Emergency phone numbers, such as Fire Dept., Police Dept., Ambulance and Hospital numbers.**
2. **Hotels with C-L-R service.**
3. **Western Union phone numbers.**
4. **Telephone numbers of local companies receiving frequent long distance calls.**
5. **Frequently called direct circuit points and tributaries.**
6. **DSA Toll points.**

Acme Visible Equipment has been designed for telephone use by Acme Systems Engineers in close cooperation with practical, experienced telephone experts. Tell us your requirements and receive our suggestions and quotations.

Used in conjunction with an Acme Visible Multi-Card Bulletin Holder.

ACME VISIBLE RECORDS, INC. Telephone System Division, Crozet, Virginia

Please send us illustrated booklet T12-7-57

☐ #1088 on Acme Switchboard Keyshelf Units ☐ #975 on Acme Flexoline

☐ Have representative call. Date_____ Time_____

☐ We are interested in Acme Visible equipment for_____ records.
KIND OF RECORD

COMPANY DEPARTMENT OF TECHNOLOGY ATTENTION_____

ADDRESS BUFFALO AND ERIE COUNTY PUBLIC LIBRARY

CITY_____ ZONE____ STATE_____

Design and Operation of Small Companies

By R. J. POLLOCK

Part 8
Urban Plant Design

THE DESIGN of a cable plant to serve an exchange boils down to a simple problem of addition. All the cable pairs needed in the outlying areas fed by branch cable legs are added together at the junction points, which operation is repeated block by block until the central office is reached. The determination of the number of pairs needed would suggest that the cable plant feeding the rural area beyond the base rate area, be discussed before the cable within the base rate area boundary is considered.

However, in order to simplify the cable picture, this discussion will cover the entire cable plant serving the exchange for both urban and rural requirements. In many cases, the cable will terminate at the base rate area boundary line, while in others it will continue far beyond that point, due mainly to the cost of facilities composed of open wire circuits necessary to meet the service demand as compared to that of cable plant.

However, present-day transmission standards indicate that the length of any cable should be approximately 18,000 feet in the smaller plants, since cable loading will be required if that length is exceeded. Normally, this is not a problem in the smaller exchange because of the lower customer saturation in the outlying areas and, therefore, this article will be limited to the design of non-loaded cable plant.

The first article of this series (TELEPHONY, Oct. 12) covered the survey procedure to determine the number of circuits needed to meet the exchange requirements. *Fig. 1* and *2* in that article showed the location of the anticipated circuits for both the urban and rural areas, which information will now be used in preparing a cable construction layout map.

Before the actual cable data is placed on the print, the field work covering the location of all pole leads to be built will have to be determined. This work will cover the actual location of the individual poles in place or to be placed and those power poles already in place which are to be contacted.

The problems which will be encountered in determining the location of the lead were discussed in a previous article and should be reviewed so that the final location as to the side of the road, street or alley will reflect the best engineering judgment.

In performing this stage of the field work, actual span measurements would normally be taken which information, if preserved, will be helpful in the actual staking operation and, if placed on the cable map, it will be valuable for future record purposes.

Pole lengths will also be ascertained at this time and properly recorded on the work papers to facilitate actual location on the cable print. Additional information such as anchors, cable extension arms, inadequate power wire clearances, and any other conditions which should be shown on the construction print, should also be recorded.

The accompanying *Fig. 5* represents a section of a cable map which was prepared by tracing on it only the streets and alleys, as indicated on *Fig. 2* (Oct. 12 issue), along with part of the rural area of *Fig. 1* (Oct. 12 issue)

(Please turn to page 32)

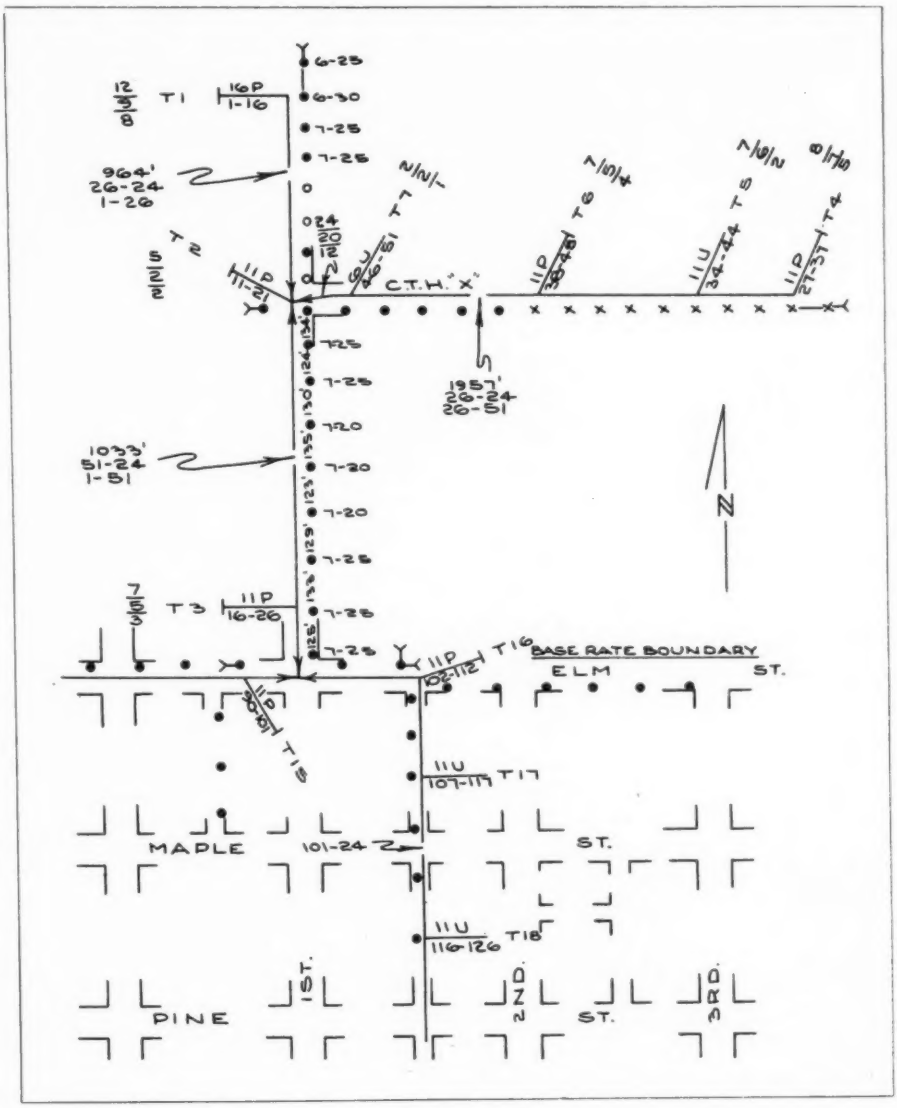


Fig. 5

fast

[versatile and economical, too]

It's downright satisfying to watch a Burroughs Sensimatic fly through even your most complex accounting jobs, move nimbly from job to job, rack up big savings in time and effort all the while.

The Sensimatic's exclusive sensing panel is the key to this advanced performance. One panel guides the Sensimatic automatically through four jobs. To switch from job to job, you merely flick a knob. And Sensimatic does the rest—swiftly, accurately, thoroughly—taking on many decisions and motions for the operator. Additional slip-in panels make it possible to do any number of jobs.

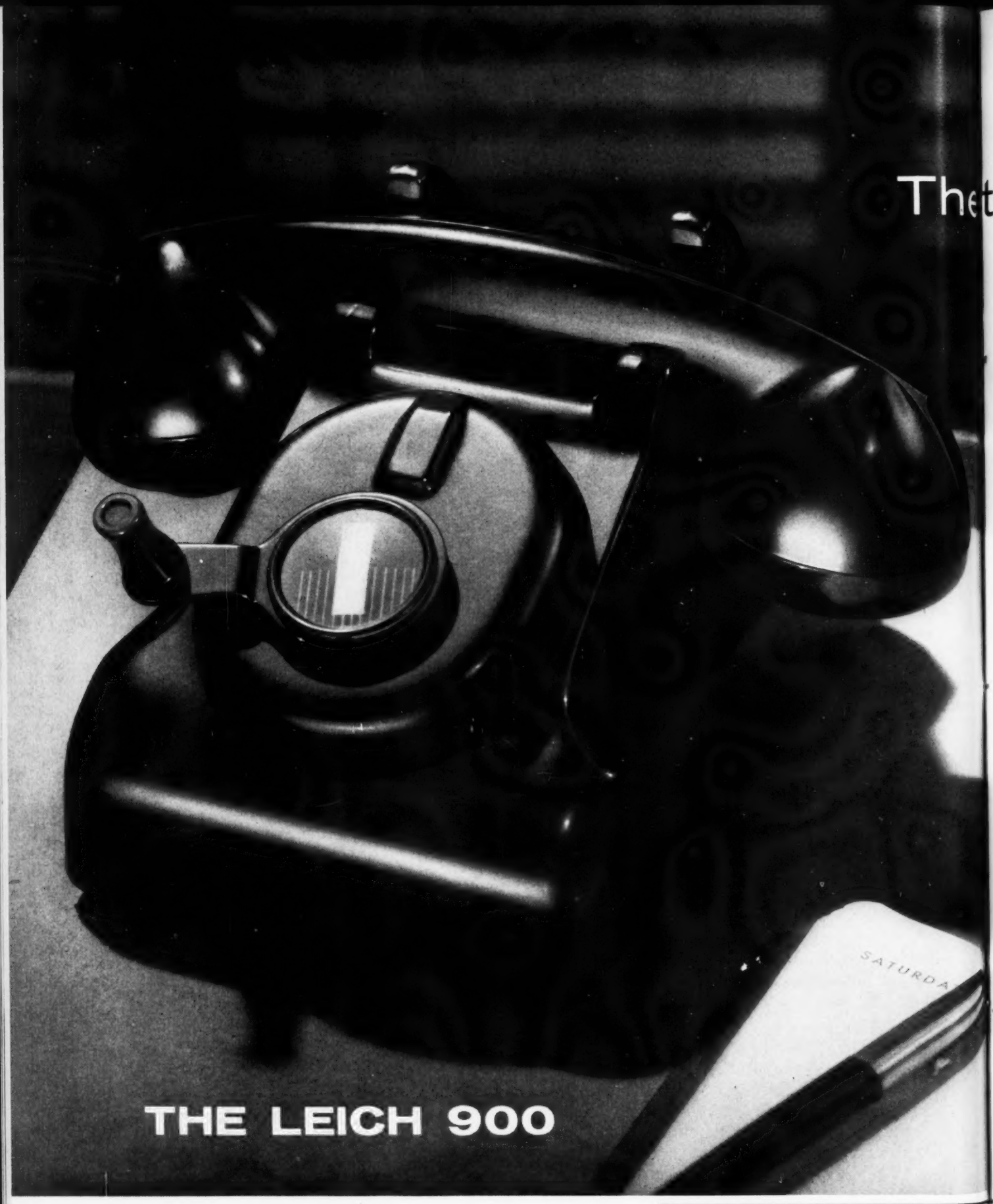
What about major changes in your accounting setup over the years? With the Sensimatic, you don't change machines—merely the panels. There's no obsolescence.

Available in six series, 2 to 19 totals, there's a Sensimatic just for you. Call our nearby branch for a demonstration. Burroughs Corporation, Detroit 32, Michigan.

Burroughs

BURROUGHS SENSIMATIC ACCOUNTING MACHINES

"Burroughs" and "Sensimatic"—Reg. TM's.



LEICH

A MEMBER OF THE GENERAL TELEPHONE SYSTEM — ONE OF AMERICA'S GRE COMMUNICATIONS SYST

telephone that has modernized hundreds of magneto exchanges . . .

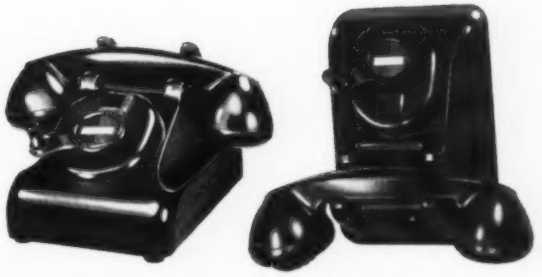
Over 180,000 Leich 900 magneto telephones are now in service. Telephone folks all over the country agree that this compact, modern telephone is the answer to their instrument problems.

With the Leich magneto telephone you can give more dependable service than ever before. Transmission and reception are the crispest, clearest you've ever offered your subscribers. The Alnico generator is powerful enough for your most heavily loaded rural lines. Your customers will find the handy generator crank easier to operate.

The unique design of this LEICH telephone enables you to offer your subscribers their choice of either wall or desk installation.

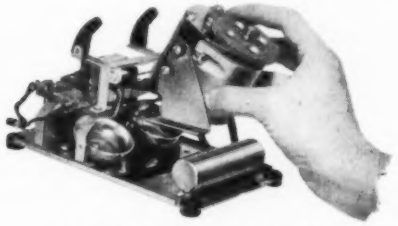
Another reason why the Leich 900 magneto telephone is such a sound investment is because it is so easy to convert to common battery or dial service. All it takes is 5 minutes and a few changes.

Here then, is the magneto telephone that offers a new high in magneto service . . . a telephone that was engineered with the problems of a magneto exchange in mind. Try one in your exchange and see for yourself.



use it for wall or desk installation!

No need to order a special model. The Leich 900 is both a wall and a desk telephone. For desk use just set it down. For wall use you simply turn it around and mount it on the wall. No changes are required. Just think . . . you need to stock but one type telephone for every requirement.



so easy to convert!

If your exchange uses Leich 900 magneto telephones and you convert to common battery or dial service, this telephone is still good. It takes just five minutes to remove the generator and change a few wires which changes the circuit to common battery. If you convert directly to dial, all you do is add the dial.

LEICH SALES CORPORATION, 427 WEST RANDOLPH STREET, CHICAGO 6, ILLINOIS

PACIFIC COAST: 11401 WEST PICO BLVD., LOS ANGELES 64, CALIFORNIA SOUTHWEST: 1227 SLOCUM STREET, DALLAS 7, TEXAS

SOUTHEAST: 5126 SO. LOIS ST., TAMPA 11, FLORIDA

manufacturers of telephones, switchboards and related apparatus since 1907

in order to show the cable plant beyond the base rate area boundary.

The heavy dark line *(Fig. 5)* indicates the cable to be placed on the poles which are identified by the open circle for a pole to be reused, and by a closed circle for those to be placed. The figures 6-30 indicate that a class 6-30 foot pole should be placed at that location, and the "X" indicates that an existing power company pole will be contacted.

The figures shown between the poles on the cable north of Elm Street represent span lengths. The size of the cable is determined by the information secured in the original survey, and those circuit demands will generally be considerably below 26-pair for the average end-terminal location, if good engineering practices were used.

In the event this is not the case, consideration should be given to terminating a 51-pair cable at that point and extending the 26-pair beyond, since a saving can then be realized by eliminating the construction of a section of heavy open wire lead.

The figures shown between the arrow-heads where the heavy cable line is broken indicates that the cable to be placed is 26-pair 24-gauge, 964 feet in length, using a cable count of 1-26 pairs.

Terminal number 1 is a 16-pair protected unit with a cable count of 1-16, shown as T-1 with a circuit load of eight on the cut-over date, nine circuits five years hence, and 12 at the end of 10 years. The figures shown at the end of the extended arrow between terminals T-2 and T-7 indicate that that cable leg will have that loading for the same year periods.

Various methods can be used to determine the cable counts in the terminals on any cable leg, as far as the lapping of the same pairs in adjacent terminals is concerned. Usually, a five-pair lap is sufficient for normal conditions, but the service possibilities of the location can require the lapping of only one or two pairs, especially beyond the base rate area boundary line when only multi-party rural lines are required.

In proceeding toward the central office location, the size of the cable will increase as each leg is added and also because of the subscriber load in the terminals along the feeder route. This might require a drastic increase in cable size along the route, if the central office is not located in the proper place to facilitate economical distribution in all directions.

It could also require the construction of costly underground facilities due to the cable being of such size that it

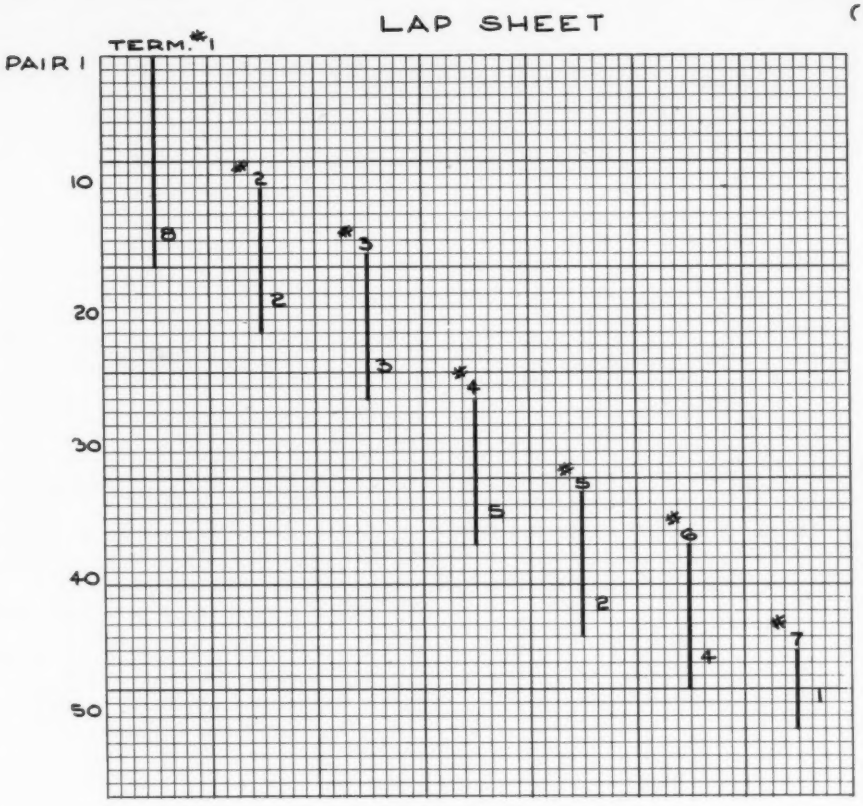


Fig. 6

cannot be supported on the aerial basis. It will also make it necessary to use lead cable, since plastic cable above 202-pair is not readily available at this time.

The cable for the entire exchange inserted on the cable map in the same manner, as discussed for *Fig. 5*, will give us the complete cable requirement for the rebuilding program.

The determination of the cable gauge to be used will be governed by the length of the longest line which is to be served by the cable. The switchboard is capable of supplying a good grade of service on all lines whose loop resistance does not exceed the manufacturer's recommendation, which will be in the vicinity of 1,200 ohms for an automatic board. If this figure is exceeded, supervisory and ringing troubles will be encountered.

Tables are available which show the circuit resistance for each gauge of cable and with this information the loop resistance of the cable from the main frame to the end terminal can be readily determined. If the results of this calculation are added to that secured by following the same procedure for the iron wire on the longest circuit, the maximum loop will have been determined.

A sample calculation of this type covering the longest line is as follows:

10 miles—.109 iron wire @ 68.2 ohms/mile	= 682 ohms
5500 feet—24 ga. cable @ 54.9 ohms/1000 feet	= 302 ohms
6000 feet—22 ga. cable @ 34.8 ohms/1000 feet	= 209 ohms
Total loop resistance	1193 ohms

The resistance figures used for both iron and copper wire are secured from handbook wire tables or suppliers catalogs. Variations will be encountered due to temperature conditions, however, the majority of these tables will indicate the resistance of either 20° Centigrade or 68° Fahrenheit, which is the same temperature expressed in a different manner.

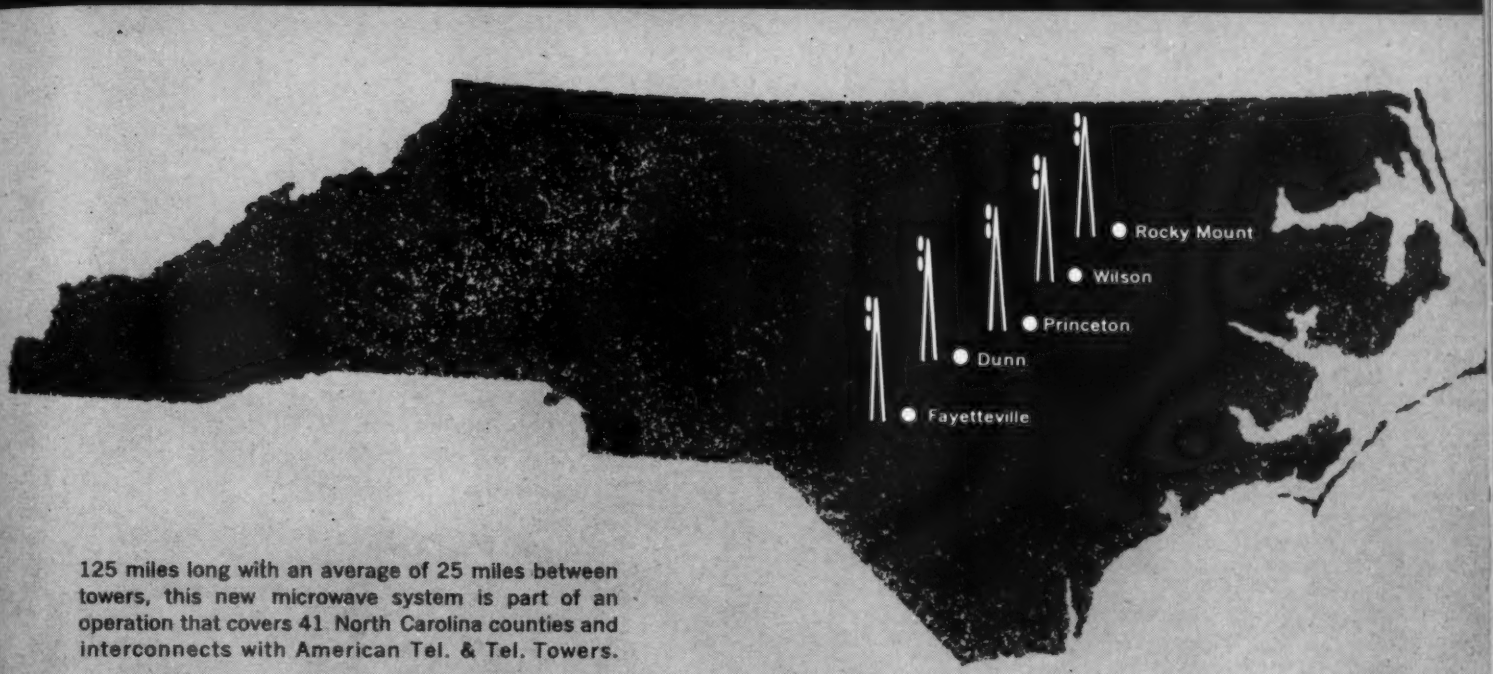
Cable maps usually show the cable in feet so it is simpler to express the conductor resistance on the 1,000-foot circuit basis. This is readily accomplished by dividing the circuit mile figure by 5.28. If the tables show the resistance on the individual wire basis that figure should be multiplied by two to reflect the circuit loop.

If the number of lines exceeding the maximum operating loop are limited, it is more economical to replace the rural iron circuits with Copperweld wire which will reduce the over-all resistance of the circuit loop.

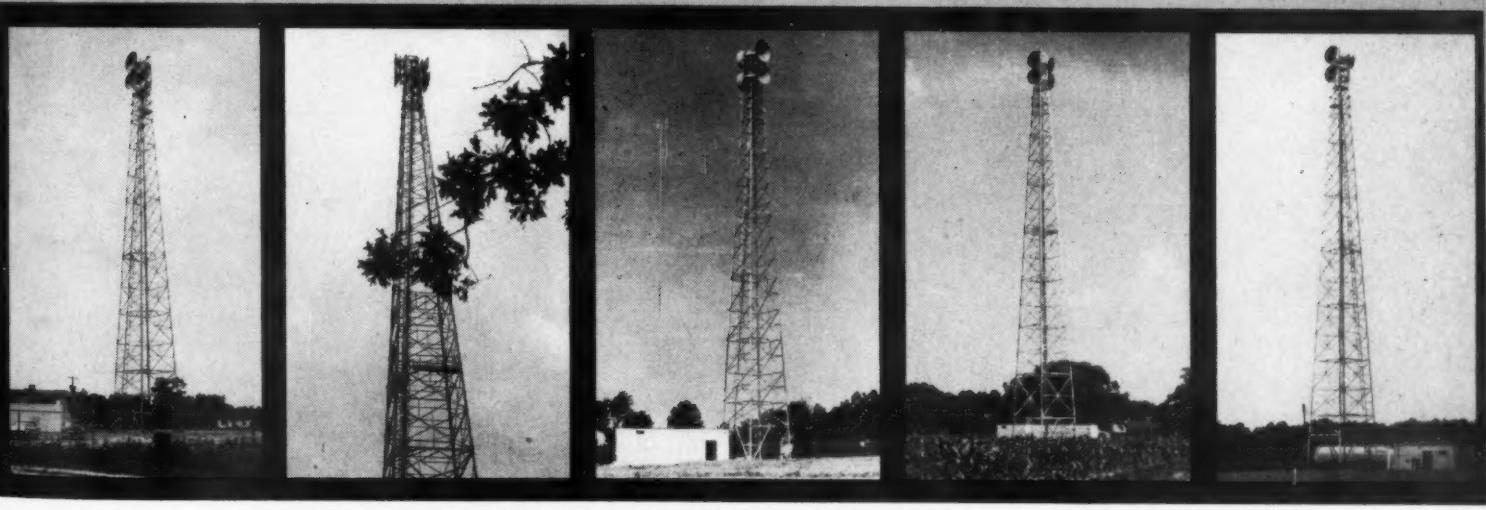
A further reduction can be made by adding long lines equipment in the central office and/or high efficiency telephones. The cost of either or both of these plans should be compared with a third one, which consists of increasing the gauge of the 26-pair cable serving the end terminal. The reduc-

(Please turn to page 36)

Progressive telephone company expands microwave service with five more Blaw-Knox towers



125 miles long with an average of 25 miles between towers, this new microwave system is part of an operation that covers 41 North Carolina counties and interconnects with American Tel. & Tel. Towers.



Erected by the Radio Construction Company of Pittsburgh, these Blaw-Knox Microwave Towers range from 150 to 250 feet high, and are built to handle additional antennas as service is extended.

Carolina Telephone and Telegraph Company have just installed their second microwave system since 1954. The new five tower section simplifies future expansion and permits the addition of hundreds of circuits at diminishing circuit cost.

Constantly extending and improving customer service, this company has nearly tripled its services in ten years to now serve nearly 150,000 telephones.

Today, as in 1954, Blaw-Knox Microwave Towers provide the dependable structures needed in an area where hurricanes have occurred in recent years. Located in a section where wind velocities have reached 100 miles per hour, Blaw-Knox Towers help maintain continuous service necessary for good customer relations.

A microwave system may be the cost cutting answer to your own expansion plans. For details on Blaw-Knox tower engineering, design, fabrication and erection services, write for Microwave Tower Booklet 2538.

BLAW-KNOX

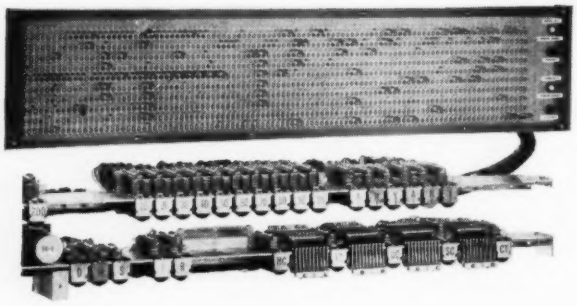
BLAW-KNOX COMPANY

Blaw-Knox Equipment Division
Pittsburgh 38, Pennsylvania

MICROWAVE TOWERS

Blaw-Knox builds guyed and self-supporting towers for Microwave, AM, FM, TV, Radar, Communications . . . Transmission Towers . . . Parabolic Antennas . . . Special Structures. All custom built to meet your requirements.

NOW AVAILABLE *at nominal cost*



Sectional View of Computer Intercept Unit for 100 Line TPL or 1,000 Station TPS Installation.

Advanced technique of printed circuity is used in this equipment. The Magnetic Impulse Counter is the basic unit of the computer register circuits, supported by standard telephone relay apparatus of recognized manufacture.

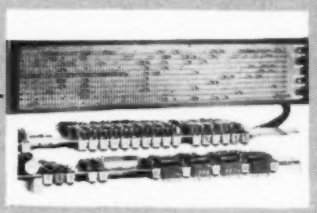
Congratulations to the U. S. Independent Telephone Association and its thousands of member companies on this 60th Anniversary Year.

Other UNIVERSAL Telephone Equipment:
DIGIT ABSORBER for 2-5 Numbering
Code-to-Selective RINGING CONVERTER

INDEPENDENT

UNIVERSAL 100% COMPUTER INTERCEPT

DIRECT DISTANCE DIALING
DEMANDS 100% INTERCEPT



Buy the ultimate requirements in intercept equipment. Not "merely adequate" . . . not 20% . . . not 99% . . . but 100% intercept is the ultimate requirement for direct distance dialing. Universal Computer Intercept offers 100% intercept at nominal cost, compatible with any make switchboard, and easily inserted anywhere in the dialing train. The unit is completely factory wired and may be installed by regular maintenance personnel. Simplicity of design lends to minimum maintenance requirements.

CHECK THESE ADDITIONAL BENEFITS OF UNIVERSAL COMPUTER INTERCEPT

- ✓ **Increase Schedule A Commissions.**
  Your TPL will have the effective features of TPS intercept *to add to* your toll settlement.
- ✓ **Increased Revenue through Increased Trunk Usage Time.**
  Reduce the repeated attempts on long-haul toll calls that keep valuable toll switching apparatus tied up.
- ✓ **Savings in Time and Material in Adding Intercept Service to your Operation.**
- ✓ **Intangible Advantages.**
  - Immediate intercept of calls to busy lines for non-working or changed numbers on these lines.
  - Intercept of incoming toll calls by request of customer or commercial department.
  - Many others of commercial value.

TELEPHONE DIVISION

UNIVERSAL
CONTROLS CORPORATION
OFFICE AND PLANT – CARROLLTON, TEXAS
MAIL ADDRESS – P. O. BOX 13122, DALLAS 20, TEXAS

MAIL THIS COUPON TO THE NEAREST ADDRESS

Gentlemen: I am interested in your Universal COMPUTER INTERCEPT.

NAME _____
POSITION _____
FIRM _____
ADDRESS _____
CITY _____ STATE _____

T-12-7

KELLOGG
A DIVISION OF
KELLOGG K IT&T

6650 S. CICERO, CHICAGO 38, ILLINOIS

SALES OFFICES

5924 S. PULASKI RD. CHICAGO 29, ILL.	1515 TURTLE CREEK BLVD. DALLAS 7, TEXAS
4501 TRUMAN ROAD KANSAS CITY 1, MO.	1555 WEST FOURTH STREET MANSFIELD, OHIO
23 BRODERICK ROAD BURLINGAME, CALIF.	1594 SOUTHLAND CIRCLE, N.W. ATLANTA, GA.
6100 EXCELSIOR BLVD. MINNEAPOLIS 16, MINN.	165 PROSPECT STREET PASSAIC, N. J.

DEPARTMENT OF TECHNOLOG
BUFFALO AND ERIE COUNTY PUBLIC LIB

XUM

tion in loop resistance will be in proportion to the length of cable affected by the change in gauge.

Unless there are excessively long cable and rural open wire runs, combinations of 22, 24 and 26-gauge cable will take care of the average exchange requirement. While the extensive use of 26-gauge may be advisable if long loops are not involved, the cable first cost economies will be largely offset by excessive future increased cable maintenance. However, the use of the finer gauge conductors in the feeder cables near the central office is not as susceptible to this condition as far as lightning damage is concerned.

Completion of the cable gauge calculation will supply the gauge for all cables, which information should be placed on the cable map as previously discussed.

The size of each terminal is determined by referring to *Figs. 1* and *2* (Oct. 12 issue) and their exact location in the urban area is governed by the information secured in the survey of each block. Protected units should be specified in all locations where power hazards exist, and where the lines serving them are subjected to lightning conditions.

An open wire lead or drop wire run in excess of 1,000 feet should have terminal protection, although, in many instances, it is advisable to change that figure because of local conditions. Power hazards and local lightning problems normally will establish a standard which will assure safe operating conditions for both urban and rural facilities. While the cost of a protected terminal is considerably above that for one of the unprotected type, the installation of a protected unit will, in a large number of cases, greatly reduce future operating costs, not to mention station outages.

This completes the information to be shown on the cable map so that it is now possible to make up a list of the materials needed to do the urban cable work. However, at this point it is advisable to recheck the terminal layout scheme for all cable, since errors can creep into any job. An accepted procedure for this check is to prepare lap sheets showing all cable runs.

An example of such a sheet is shown in *Fig. 6*, where the numbers on the left hand side of the sheet are the cable pair numbers, and the short heavy line numbered 1 indicates the pair count in that terminal, which is T-1 on *Fig. 5*. The numerals to the right of each terminal count line indicate the pairs in service on the cut-over date.

Continuing these lap sheets to cover all the cable pairs terminating on the main frame, and showing all connected terminals in their proper count location, will give an exact picture covering the appearance of any and all pairs. It also will show the cable loading, that is, the number of pairs in use when the cable is placed in service.

Many engineers design cable jobs with an original loading of 75 per cent or higher, which is satisfactory if the original customer survey was made to include all service possibilities. The sales resistance of many prospects for future telephone service is such that they will not subscribe for service, and will emphatically so indicate at the time the survey is made, because of reasons of their own, made up of objections to the rates, poor service, heavily loaded lines, or what have you. Many of them will demand service a short time after the cut-over, and others will seem to come from nowhere with the same request.

Unforeseen conditions will occur in any location and, if the original cable fill is too high, it will result in a loaded cable plant far in advance of its expected life span. There are many cable jobs in existence today, either in their entirety or in some segments, which are completely filled because of this engineering practice. It can be said that it is done to reduce costs and, therefore, hold down the carrying charges of plant which is in place but not being used. When we consider the loss in revenue, and the fact that the plant will have to be enlarged with greater material and labor cost in order to supply the service demand, the logic of that procedure is difficult to understand.

It is now possible to prepare a list showing all material needed for the cable job and one of the problems to be solved will be whether to use lead or plastic cable. Many of the objections to the use of the plastic cable have been overcome and it has been beneficial to small telephone companies in recent years.

Because of the type of insulation used, service outages, noisy lines, cross ringing and other such troubles are held to a minimum, which is a tremendous advantage to the small company.

Plastic cable is light in weight and, therefore, a saving can be made in constructing the plant to support it, although the actual spinning labor is approximately the same as in the case of lead cable. It does, however, have a tendency to "dance," that is, a few spans may vibrate violently even with a minor wind.

This problem has received considerable study and can be remedied in a number of ways, the least expensive of which is to place an inverted catenary installation. This construction is very simple and the material used can be salvaged from an open wire job along with two drive hooks and a span clamp. The clamp is placed in mid-span with the iron wire attached to it and run to the drive hooks, placed approximately 3 feet below the cable at each of the poles.

Sufficient tension should be placed on the wire to make it taut before serving or sleeving it to the drive hooks. In the great majority of cases this will eliminate the vibrations, but should they continue, the tension applied probably is not sufficient and should be slightly increased.

Excessive long span construction may require span clamp attachments at each quarter point, in addition to that in the center of the span, with an 18-inch supporting wire between the span clamp and the catenary wire.

Cable trouble, if it does occur, can usually be handled by the small telephone company maintenance man without the services of a splicer. In the case of lead cable, the trouble could be handled locally to the point where the lead sleeve was to be placed.

Many of us are not able to wipe a lead sleeve and so the sheath opening was taped as a temporary measure, which, in far too many cases, ultimately assumed a permanent status, that is, until the tape deteriorated. As a result, the trouble procedure was repeated, resulting in added costs and, no doubt, customer resentment because of the service outage.

The splice at the junction of two plastic cables has received considerable attention by both manufacturers and operating companies. A number of satisfactory sleeves are on the market and, while their first cost may appear to be high, a number of them permit the opening of the sleeve at a later date by mechanical means.

In other words, they can be reused if it is necessary to open the sleeve for trouble reasons, which reflects a reduction in the over-all cost of the particular sleeve involved. However, an economical sleeve can be fabricated with tape now on the market, which will give a sleeve life that should correspond with that of the cable sheath.

The construction of a waterproof sleeve of this type is not difficult and can be done by the average exchange troubleman. The removal of the conductor insulation can be accomplished by means of an insulation stripping tool, and the wires pig-tailed together in the same manner as that used for pulp insulated conductors.

"re: *Your shipment on the 5th...*"

Some people still send communications one character at a time.

Others use DATAFAX—the fast Stewart-Warner electronic way to transmit all data over telephone lines.

Datafax transmits and records any material: correspondence, drawings, pictures, printed matter, even handwritten notes. And since copies are exact duplicate images of the original, chance for error is eliminated.

Cost?

Automatic transmission and recording eliminate need for full-time operator; recorders will even respond to transmissions sent after the office is closed for the day. Datafax also eliminates retyping, proofreading, intermediate handling, intransit delays—and their clerical costs. The clear, smudge-proof, permanent Datafax copy costs less than 2¢ for a letter-sized unit.

Chances are your accounting . . . inventory control . . . engineering . . . production . . . branch sales . . . and warehouse operations have outgrown Primitive Communications. If so, you'll want to find out about Datafax. First, send for your copy of the free Datafax bulletin. Write: Stewart-Warner Electronics, Dept. 24, 1300 N. Kostner Ave., Chicago 51, Ill.

STEWART SW WARNER **ELECTRONICS**

a Division of Stewart-Warner Corporation

The use of the standard cotton sleeve on this splice will greatly reduce the insulation between conductors and, therefore, many plastic types have been designed to overcome that condition. However, the problem of sealing each end of the individual sleeve on each conductor has not been satisfactorily solved except on butt splices. Filling the sleeve tube with a staple silicon grease has improved the condition, but not to a point where uniformly good insulation can be built into all splices at a reasonable labor cost.

This sealing operation is not necessary if the cable sheath splice is moisture and vapor proof. A splice of this kind can be made with a lead sleeve which has not been split, the ends of which are soldered to a precast lead washer, whose outside diameter equals that of the interior of the lead sleeve and that of the center hole closely approximates the outside circumference of the plastic cable.

A good grade of adhesive compound placed around the cable and on the washer will in most cases seal out all moisture. However, making up the completed splice will require expert workmanship, resulting, in most cases, in a high sleeve cost.

Many companies have resorted to a simpler method, resulting in a splice which accomplishes the same purpose at a reduced cost. Here each conductor is insulated after it has been pig-tailed with a piece of electrical tape of sufficient length so that it can be folded into a "V" shape and placed over the bare wire and continued up onto the insulation. Firm pressure applied to the tape by the thumb and forefinger will result in a well-insulated splice.

After all conductors have been insulated in that manner and laid parallel to the cable, the splice is wrapped with the same type of non-adhesive tape as used by the manufacturer. It is available through telephone supply houses in several lengths to accommodate large and small jobs. The splice is now wrapped with the aluminum foil which is salvaged from the cable during the first splicing operation.

In order to maintain sheath continuity for induction and lightning purposes, the ends should be lapped over that on the cable beyond the splice opening and soldered at that point. The operation can be greatly simplified if aluminum flux is used. Specially designed bonding ribbon is also available for the purpose. The operation is continued by wrapping the foil with a filler tape which is supplied in 5-foot lengths, approximately 2½ inches wide.

Two layers of this filler may be required if the foil-covered splice contains deep wrinkles. The complete splice is then wrapped with 2-inch electrical tape of the cold weather type, so that a 1½ to a 2-inch lap is made onto the sheath at each end of the splice. Several layers should be placed in order to assure a water-tight installation which will approximate the life of the cable sheath.

Wye splices can be built in the same manner and will withstand weather conditions if the filler tape is properly applied in the groove of the wye cable branch.

Obviously, this type of splice cannot be opened to clean trouble at a later date without sacrificing the outside tape and interior filler, and engineers have, therefore, designed splicing kits of various materials which solve that problem. These kits, while high in first cost, do not require the labor necessary to make one of tape construction and the splice can be reused.

Terminals spliced to the cable can be handled in the same way and, again, this operation has been further simplified with a special terminal, the housing of which has been designed to fit over the cable sheath on each end of the splice opening after the necessary pairs have been terminated on the terminal lugs.

One of the advantages of this type of terminal is that it need not be fully equipped at the time of installation, since additional pair lugs can readily be added at a later date at a very nominal cost. The difficulties encountered due to weathering of the terminal housing, which appeared in the original units, have now been eliminated in the redesigned terminals which are now on the market.

Pole and strand mounted protected terminals are now available in the fuseless type which perform very well with plastic cable and, if properly grounded, will supply a more trouble-free operation. Their use also eliminates the cost of blown fuse replacements which is a considerable factor in communities subjected to heavy lightning conditions.

In the past, this was not an expensive item, since many companies rewired fuses on an economical basis —that is, until the advent of the ceramic type which replaced the old wooden unit. Fire underwriter's approval specifies that the fuse wire be insulated with a flash-proof sleeve inside the ceramic tube, which practically eliminated the refusing of fuses, as it is not economically possible to re-install the fuse wire through the protective sleeve.

It is true that the fuse can be refused by by-passing the flash protector, but serious legal difficulties might be encountered if an accident occurred which could be traced to the non-standard fuse.

The use of a fuse type end-terminal has presented problems which are not generally recognized, despite the fact that they contribute heavily to the maintenance costs. In the case of protected cable pairs feeding rural open wire leads, any lightning condition in the area will set up an opposite potential current flow in the cable from the central office ground and any others along the cable lead. This, coupled with that generated electrostatically, will result in a current flow through the various fuses, outwardly over the rural lines to the storm location.

The intensity of the potential on the circuits will depend upon that of the storm cloud condition and should a lightning discharge occur, even though it does not strike the telephone line, the open wire facilities, along with the cable, may be subjected to a surge current beyond the carrying capacity of the fuses in the circuit.

The open wire charge would neutralize through the various pole top arrestors, insulator leakage, and rural station protectors, but that contained in the cable would continue to surge to the central office ground, making it possible to encounter blown cable pairs, especially if finer gauge pulp insulated cable is used near the central office.

While the following statement may be difficult to prove, it appears that, in some instances, the outward flow of the current to the storm area is such that the fuses are blown before the lightning discharge occurs, in which case the results as discussed above will be the same. It also may be assumed that the cable pairs nearer the central office ground could be damaged before the terminal fuses fail, if the build-up of the storm conditions are exceedingly rapid.

It would appear that the use of fuseless type protection should greatly minimize this condition, and it would also suggest that, if underground facilities are involved which contain finer gauge conductors, the junction splice be placed at least one span beyond the riser in order to make the fault point more accessible.

Present code requirements may not permit the use of this type of protection on station arrestors, but test installations have revealed decided advantages over fuse type protection, and it is likely that changes will be made as soon as the results of these tests have been fully studied.

(Please turn to page 83)

New bulletin to give you

THE FACTS ON NEW COPPERPLY® WIRE

Bulletin 202 contains helpful engineering data and general information on the features, characteristics and use-advantages of unique Copperply wire.

And Copperply *is* unique with its electroplated copper coating, precise concentricity, and weld-free lengths. It is available in a broad range of sizes, coating weights and steel core analyses . . . and on reels up to 600 pounds for insulating, or in standard coils for field construction.

So write National-Standard, Niles, Michigan for your copy of Bulletin 202. It gives the facts you should have at hand.

NATIONAL STANDARD

DIVISIONS: NATIONAL-STANDARD, Niles, Mich.; *tire wire, stainless, music spring and plated wires* • **WORCESTER WIRE WORKS, Worcester, Mass.;** *high and low carbon specialty wires* • **WAGNER LITHO MACHINERY, Secaucus, N. J.;** *metal decorating equipment* • **ATHENIA STEEL, Clifton, N. J.;** *flat, high carbon spring steels* • **REYNOLDS WIRE, Dixon, Ill.;** *industrial wire cloth.*

MAIL COUPON TODAY!

National-Standard Company, Niles, Michigan:
Please send me a copy of Copperply Bulletin 202

Name_____

Title_____

Company_____

Address_____

DEPARTMENT OF TECHNOLOGY
BUFFALO AND ERIE COUNTY PUBLIC LIBRARY

XUM

TROUBLE CLEARING

The High School Graduate

By L. N. MARTIN

THE AMERICAN High School is much in the lime-light these days. Some one has discovered that the Russian "Ten Year School," which is equivalent to our grade and high school, is much superior to our school system. We do not believe this is true. However, the Soviet school system undoubtedly has some points of superiority over ours and we should profit by their experience. The communists are stressing science and mathematics to such an extent that they are probably neglecting other important subjects in a well-rounded education. Also, we wonder how they can teach young people to "think for themselves" in *physical* science and yet blindly follow the party bosses in all matters pertaining to *political* science.

Is this writer qualified to discuss schools and education and how does this subject pertain to the telephone business?

Many years ago we graduated from a high school which was considered first class at that time. And, we stood third in our class. Several times since then we have been invited to address a high school science class on the telephone business and its relation to the science which the class was studying. That is the extent of our experience in the high school classroom. However, we have had extensive contacts with the product of the high school—The Graduates.

We have interviewed hundreds of young men, just out of high school, who were applying for a telephone job. We have given tests to many of these. Tests designed to determine whether or not they could make practical application of the things they had learned in school, and whether or not they would continue to learn new things as they performed their daily work.

We have also studied the progress of telephone men; some who had high school only; some with high school plus one to four years of technical school or college training; and some older employes who started with little formal education. Therefore, while we admit that we know little about schools, as such, we have had a large experience with the men the schools have produced.

PART 60. The preceding article in this series appeared on page 28 of the Sept. 7 issue.

The large telephone companies will not employ a man who has not completed high school and they prefer that he also have at least one or two years training in a technical school or college. Smaller companies may or may not follow this rule. Is such a rule just? We will not discuss this point at this time, except to say that, in our opinion, a man *can* learn anything out of school that he can learn in school *but very few men do.*

So a bright looking young man carrying a new diploma tied with ribbons that proudly display his class colors comes into the office to apply for a job in the telephone industry. What does that diploma mean?

In our high school days it meant that the man had completed a prescribed course of study with very little choice of subjects. At our high school it meant that he had two or more years of algebra; one year of geometry; one or two years of physics with laboratory work; one year of another science; two years of Latin or a modern language (or one year of each); plus a well-rounded course in English literature and composition, history, etc.

The diploma from a modern high school does not mean what it once did. We were shocked the first time we interviewed a boy just graduated from high school and found that he had no algebra, no geometry, and no physics, chemistry or other major science.

Right or wrong, the high schools now permit elections and specialization throughout the course, sometimes (we believe) at the expense of a well-rounded education.

So we must ask the applicant: "Just what subjects did you study in high school; how many semesters in each; what grades did you make in each?" Then we should verify his answers from the school records.

Systems of grading are not uniform. Also, some schools have a tendency to graduate all students while others are more strict. We should learn the meaning of each grade as used in that particular school.

Some employers attach more importance to "standing in class" than they do to grades. Some will employ only those who were in the upper third of their class. Others are satisfied if the young man was in the upper half of his class (better than average).

What subjects taught in high school are useful in telephone plant work? Undoubtedly science and mathematics come first. Physics, especially the electrical portion, is the most useful science. We may say that it is a "must." If the young man has not chosen physics when it was offered by his school, *why?* If he does not have enough interest in science to take advantage of a free course in the basic science, is he really interested in telephone work? Would he make a good employe? In some cases, however, the answer may be that he has been ill-advised.

In this connection we do not wish to imply that a boy can get through high school without *any* science. The modern high school has a short course called "general science" which must be taken by all who do not major in science. We have examined several of the texts in use and we are reminded of the old adage: "A little learning is a dangerous thing." However, like

(Please turn to page 85)

you can relax because Preformed dead-ends never will

Preformed Dead-Ends and Guy-Grip dead-ends hold full rated strength of strand

These dead-ends won't relax their tight grip. Once on, the only way to remove Preformed dead-ends or Guy-Grip dead-ends is to do so intentionally. Because of the non-slip grip and because there are no concentrated stresses and no fatigue points, your guy and messenger strands are 100 per cent safe.

Some other advantages are apparent, too. For instance, you will notice that, with Preformed, you dead-end the B-rural messenger without cutting it. Other dead-ends require cutting and some require tools for application. Also, Preformed makes it possible to go around corners without splicing.

If your dead-ending doesn't look as neat as this, if it doesn't go on as easily and assure safety, or if you have to keep checking to make sure it's holding, write PREFORMED LINE PRODUCTS COMPANY, 5349 St. Clair Ave., Cleveland 3, Ohio. Cable Address: Preformed-Cleveland . . . in 10 years the leading manufacturer of armor rods, dead-ends, Guy-Grip dead-ends and other line accessories.

PLP

You can look to Preformed

Made in accordance with or for use under one or more of the following U. S. Patent Nos.: 2,761,273; 2,609,653; 2,275,019; and 2,587,521. Other patents pending.

Two-way peephole

by John Voss

It's no secret that psychologists, when they want to know about human behavior, often study animals.

Not that people behave exactly like animals, but many things animals do give scientists important clues about human beings.

The favorite animal of researchers is not the proverbial guinea pig but the chimpanzee, which they say is about the smartest creature in the world, next to man himself. So smart, in fact, that when they're being watched they know it, and they don't act natural. They show off instead, and this raises heck with scientific experimentation.

Well, one clever psychologist figured out a way to outsmart his chimp. He put the animal in a windowless room. The only way to see in or out was through a small peephole in the door. The man waited an hour or two for the animal to get used to his new surroundings and start acting natural. Then the psychologist crept up to the door, pushed aside the peephole cover, and looked in.

All he saw was the chimpanzee's eye staring right into his!

When I heard this story I was immediately struck by the parallel between what this psychologist was doing and what we do in business.

For example, in a service business like yours you keep close contact with the pulse of the community you serve. You're always watching to see how well satisfied your subscribers are, so that if any problems come up, you can get to work immediately to solve them.

In a situation like this it's easy to lose sight of the fact that while you're watching your customers, *they have their eyes on you.* They want to be absolutely sure that you're giving them the very latest and best in service. And to do that, you need the very latest and best equipment. This is where we come in.

We've been in the telecommunication business since 1894. We have the close understanding of the needs of independent telephony that comes only from such long experience. At the same time we're constantly looking ahead, keeping up with the latest developments in the technology of communications, so that we can supply you with new products and techniques that mean increased efficiency and greater profits for you.

In this complex business we're in, all of us are facing challenges all the time. You're watching your subscribers in order to stay on top of their needs. They're watching you to see to it that you give them what they need and want. You keep an eye on us to make sure we supply you with the very best products we can make. And we, in turn, keep a careful eye on you and your customers so that we're always abreast of what the needs are in the field.

This state of alertness on all our parts is good business and a sure means of progress.

John H Voss

Vice President and General Manager
Telecommunication Division

STROMBERG-CARLSON, A Division of General Dynamics Corp., Rochester 3, N. Y.

Advertisement

THE Plant Man's Notebook

BY RAY BLAIN, TECHNICAL EDITORIAL DIRECTOR

A BROTHER of the writer, Foy Blain, retired from the Pacific Telephone & Telegraph Co. about a year ago and finally got around to cleaning out his attic. In throwing away old papers and magazines, he came across various items of interest which we quote as follows:

The *San Francisco Bulletin*, under date of July 19, 1919, carried the following headline: "Phone Strike Leader to Wire Order." The story reads in part:

"R. E. Swain, chairman of the general strike committee, today telephoned to Miss Julie O'Connor, international president of the Telephone Operators' Union, who is now in Washington, D. C., asking her if the order instructing the strikers to return to work was correct.

"The connection was poor and Swain could not understand Miss O'Connor's reply. She promised to telegraph her answer immediately and the strike officials are hourly awaiting the receipt of this message."

The same article had the following to say with reference to the new wage scale:

"The new wage scale put into effect by the company provides for an eight-hour day with double time for overtime, and $6.00 per day for electrical workers. The schedule of wages follows:

"Telephone operators ranging from $12 a week for beginners to $24 a week at the end of three years service.

"Construction foreman, month.	$175.00
"Gang foreman, per month....	170.00
"Head gangman, per day.....	6.25
"Cable splicer, per day.....	6.50
"Lineman and all others, day..	6.00"

Then the automobile section of the same paper advertises Dodge, Chevrolet, Studebaker, Sterns, Mitchell, Hupmobile and Winton automobiles. An ad for Goodrich Silvertown tires stated that they guaranteed 6,000 miles for fabrics and 8,000 miles for cords. (A total of 40,000 miles or more is not uncommon these days for one set of good and properly maintained tires.)

The speed limit for automobiles was reported to have been increased from 30 to 35 mph under the following restrictions: "The 35 miles per hour speed can only be traveled and the driver be within the law in the daytime and when there is an unobstructed view of the road ahead for a distance of 400 feet and of intersecting roads for a like distance."

At this time, also, there was a big argument in progress over the streetcar fare. It seemed that one faction was attempting an increase from 5 to 6 cents. This increase was meeting bitter opposition.

Then a magazine, *The Mayflower*, under date of May 1895, carried an advertisement of the Electric Telephone that reads: "Sold outright, no rent, no royalty. Adapted to City, Village or County. Needed in every home, shop, store and office. Greatest convenience and best seller on earth. Agents make from $5 to $50 per day.

"One in a residence means a sale to all the neighbors. Fine instrument, no toys, works anywhere, any distance. Complete, ready for use when shipped.

"Can be put up by any one, never out of order, no repairing, lasts a lifetime. Warranted. A money maker. Write W. P. Harrison & Co., Clerk 10, Columbus, Ohio."

This same magazine advertises a 14-inch lawn mower for $7.00, an organ warranted for 25 years for $25. Pianos were slightly higher, as they were advertised complete with stool for $169.

Another magazine, *St. Nicholas*, published in February 1892, advertises the Hartford Safety Bicycle for $100. With cushion tires, it cost $105. It had ball bearings and was guaranteed. Much better bicycles are undoubtedly advertised today for less than half this amount.

This same magazine carries an ad for the Aermotor Co. of Chicago that claims they sold over 60,000 windmills in 1892. The ad states further: "If you want a tower you don't have to climb and the wheel that runs when all others stand still. Or if you want a wheel that will churn, grind, cut feed, pump water, turn grindstone and saw wood, i.e., a geared Aermotor that will do the work of four horses at the cost of one ($10) write for copiously printed matter."

When one reviews these old papers and magazines, it is difficult to realize that so many changes have taken place in the past half century, and also to notice how the prices of some articles have increased while others have decreased. This, however, represents progress. Some day, perhaps we will clean out our attic and, when we do, we may have another story for you at that time.

•

Development is underway on two systems for emergency fire and police telephone reporting. One of these systems will require direct lines from each call box to the central receiving center. The other will employ concentrator-identifiers to reduce cable pair requirements.

There is little doubt that in the not too distant future telephone companies will handle all fire and emergency reporting systems in most of our towns and cities.

•

Telephone directories are rapidly increasing in size despite the fact that smaller print and thinner paper are being used. Four columns are printed on each page and consideration is now being given to a plan to make the pages ⅝-inch wider and increasing this to five columns.

The Bell System now prints about 2,800 different directories carrying approximately 37 million listings. This re-

XUM

quires about 110,000 tons of paper a year.

The cost of publishing and distributing these directories is enormous. The Bell System spends over $150 million a year on directories. Picking up and returning the old directories to get them out of circulation is in itself no small expense.

In addition, due to the use of thin paper printed heavily on both sides, there is usually no old paper recovery value. The cost of removal of the high ink content is greater than the pulp value.

The average telephone customer would be horrified if you informed him that the alphabetical telephone directory would be discontinued. Or, at any rate, that is how we reacted when we first learned that such action was being considered as a test case in one of our large cities within a year.

Then we carefully considered the question and decided that perhaps we do not use our 1422 page directory in the Blain home more than a half dozen times a year. Our directory always has an unused look when its replacement arrives. The yellow pages, however, are referred to frequently.

The alphabetical directory is so large and cumbersome, and the print so small, that the average customer finds it far more convenient to call information for a required number. In addition, too, most customers nowadays have a list of frequently called numbers and this meets practically every daily need.

If alphabetical directories were not provided, the average customer would soon compile a directory of most frequently called numbers so that assistance from the information operator would seldom be required.

There is no doubt that if the alphabetical directory is discontinued, the information traffic will increase considerably. It is not believed, however, that the increased cost of the information service will amount to more than a small part of the present cost of publishing and distributing the alphabetical directory in large cities.

Moreover, there is a probability that with the present progress being made in electronic computers and filing systems, our information service will be handled by a machine in the not far distant future. Certainly, our present antiquated system of furnishing telephone information is not in phase with modern automation.

•

Experience is the ability to recognize a mistake the second time you make it.

Plant Man's QUIZ

By RAY BLAIN, Technical Editorial Director

Q. We have heard that by the proper use of modern materials and machinery, buried cable distribution systems need not cost any more than aerial distribution. Can you furnish us with any information on this subject?

A. We would not attempt to compare the cost of buried cable distribution with aerial plant since their costs would vary considerably because of local conditions encountered in each case.

The cost of aerial distribution plant in many new sub-divisions is increased considerably due to winding streets so often found these days in new developments. This will cause a need for an excessive number of anchors and guys that may increase the cost of aerial plant considerably.

Then, too, when the aerial plant must be placed along the streets in front of the houses, extra high poles may be required to obtain drop clearance over streets. This is especially true with the one story ranch type house now so popular throughout the country.

The cost of buried distribution plant will also be increased when rocky soil is encountered. In certain sections of the country, frozen ground makes buried cable installation impossible or at least expensive at certain seasons of the year.

If, however, everything else is equal, and if modern equipment and techniques are used to advantage, the cost of buried cable distribution will in many cases compare favorably with that of aerial plant.

In addition, consideration should be given to the reduced maintenance cost of underground plant as compared to aerial plant over a term of years.

•

Q. What size line concentrators will be made available and what number of trunks will be arranged to serve them when this type of equipment is manufactured in this country for use of the Independent telephone industry?

A. We have very little information on this subject at the present time, but we do know that several equipment manufacturers are presently giving the subject serious consideration. One manufacturer is currently considering the fabrication of the following sizes:

11 subscribers.....	4 trunks
11 subscribers.....	3 trunks
21 subscribers.....	3 trunks
21 subscribers.....	4 trunks
21 subscribers.....	5 trunks
42 subscribers.....	10 trunks

The 42-subscriber size will have four trunks assigned to each 21-line group. Then the two additional trunks will be made available to the first 21-line group that has all four trunks busy. Unquestionably, other sizes will be made available if and when required.

•

Q. What can be used for a vibration damper on open wire lines?

A. The most simple method is to loose-wrap a piece of insulated wire around the line near the insulator. Or, if you prefer, a vibration damper can be purchased from your telephone supply house.

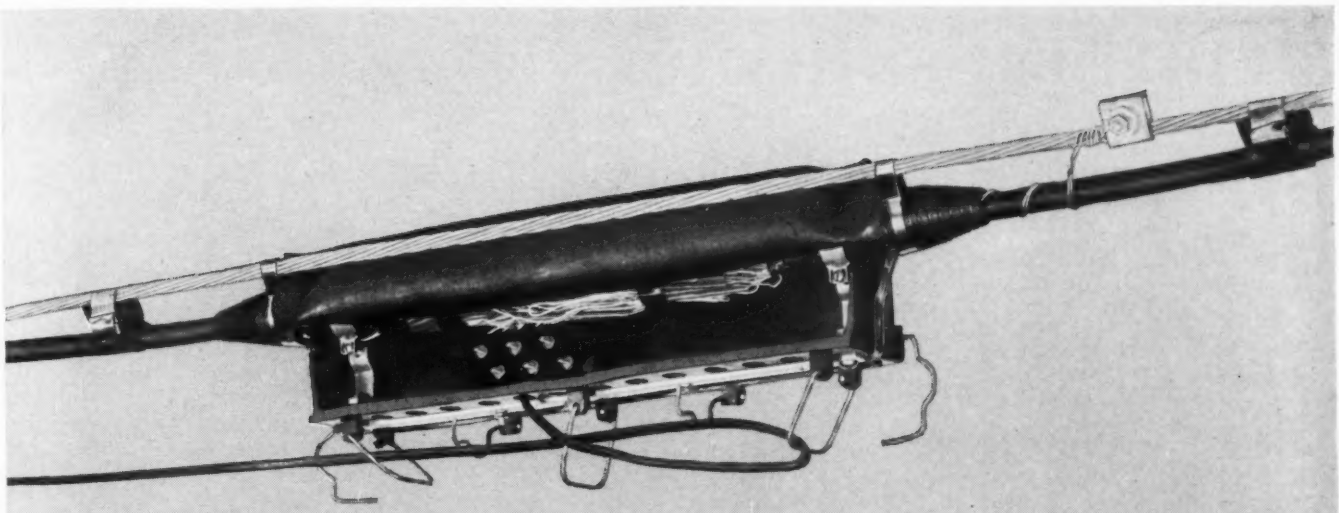
These dampers are made up of flexible polyethylene of a special compound to withstand weathering. They are helically slit with approximately three turns to the foot. This damper is 18 inches long with ¼-inch I.D., and .062-inch wall.

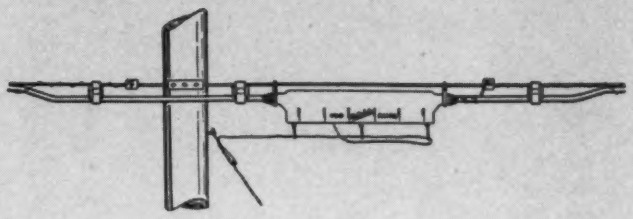
•

Q. Will it be possible to find an arc-free fuse of small capacity that has an accurate operating time?

A. We are advised that a fuse of these characteristics has been designed by combining the grasshopper fuse and the heat coil. When subjected to more than the rated current, the ratchet on the heat coil, which is permitted to revolve, releases the ground and alarm springs. After the trouble has been cleared, and the current flow is restored to normal, the fuse may be reset manually by the ratchet which is again locked into position.

XUM





More about the ready-access terminal

Reliable's new Ready-Access Cable Terminal affords an easy-to-install and easy-to-maintain terminal and splicing facility for plastic jacketed, plastic insulated conductors in aerial cable. An installer-repairman or a cable splicer can readily add up to four 6-pair unprotected terminal blocks. The space may otherwise be used to include loading coils. In future service, the flexible Neoprene cover can be folded back while internal wiring is altered to meet changing requirements.

RELIABLE ELECTRIC CO.
FRANKLIN PARK, ILLINOIS

Data Transmission

By HAROLD B. McKAY, Electronics Editor

Part 3

THE COMPUTERS made by International Business Machines (IBM) include equipment which is designed to receive information from distant points over telephone and telegraph circuits. This is done by means of an intermediate machine called a Data Transceiver. In operation, it is possible for an operator at the distant point to place a punched card in the unit and have a duplicate of the card punched out on a similar unit in the home office where the computer is located.

The transceiver does this by sending out impulses on one of four different frequencies in various combinations according to IBM's code. In a sense, it is similar to the mark and space of a teletype code.

The speed at which information can be transmitted, and, hence, the number of cards that can be punched per minute, depends upon the grade of circuit used. For instance, if telegraph facilities are used, three cards per minute could be punched on a circuit that would handle 60 words per minute on telegraph.

On voice frequency facilities, up to four separate channels may be used and 11 cards per minute "sent" on each channel.

The nature of the card system is such that several different items of information must be sent, including which columns on a card are to be used, which to be skipped, etc. This can vary according to the way the machine is "programmed."

Error Checks

The IBM system uses certain accuracy checks. The correct column information must be received as required by the program card. In addition, each transmitted signal consists of a start and stop pulse and four marking and four spacing signals. Failure to receive all of this information will cause the transmission to stop.

The signal as sent on the line is called a 10.5 unit code because it consists of start pulse, eight mark or space pulses and a stop pulse which is about 1.5 units in length. These signals are generated by oscillators within the IBM equipment which can send out frequencies of 800, 1,300, 1,800 and 2,300 cycles. The bandwidth of each of these frequencies is about 500 cycles. Therefore, if the customer is going to use four pairs of machines and all four frequencies, a bandwidth of from 550 to 2,550 cycles will be required. This is what the customer will be paying for, but, as mentioned before, he does not always get.

With this arrangement the information on 16 columns of a card can be sent over the line each second, or a fully punched card every five seconds. Checking and card manipulation will slow things down so that 11 fully punched cards can be handled per minute.

Private Lines

At present, most installations of this sort are being used with leased wire facilities. In general, a private line circuit is used, which may be either two-wire or four-wire. The usual losses which are encountered on private line facilities should not be objectionable for IBM transmission.

The IBM unit is designed to transmit at from —4dbm to +1.5dbm, depending upon the frequency used and the termination. A 4db pad may be used to produce an output which will not exceed telephone line requirements. Such a pad may also prove desirable from an impedance matching standpoint.

Listener echo at the receiving unit must not exceed 16db below the received signal, or errors may occur. Yet echo suppressors can block signals being returned from the receiver to the transmitting machine, so such suppressors must be disconnected or disabled. This may call for some sort of special switching arrangements on circuits which are used alternately for voice and IBM transmission.

In lining up a circuit for IBM transceivers, transmission tests should be made at the four IBM frequencies of 800, 1,300, 1,800 and 2,300 cycles in addition to the usual 1,000-cycle tests. The received level should not be less

This is an IBM data transceiver. If one is set up at each end of a telephone line, punched cards can be fed into one instrument, and duplicate cards will be punched out by the other, thus in effect sending the cards over the wire.

305 RAMAC*

makes toll rating automatic for direct distance dialing

With its 5-million-character disk "memory" that files and finds facts at random, the 305 RAMAC® makes automatic rating of tolls *in random sequence* a reality!

It also handles rate settlement, toll study data, and other vital traffic statistics *automatically* . . . at the same time the toll rating is being done.

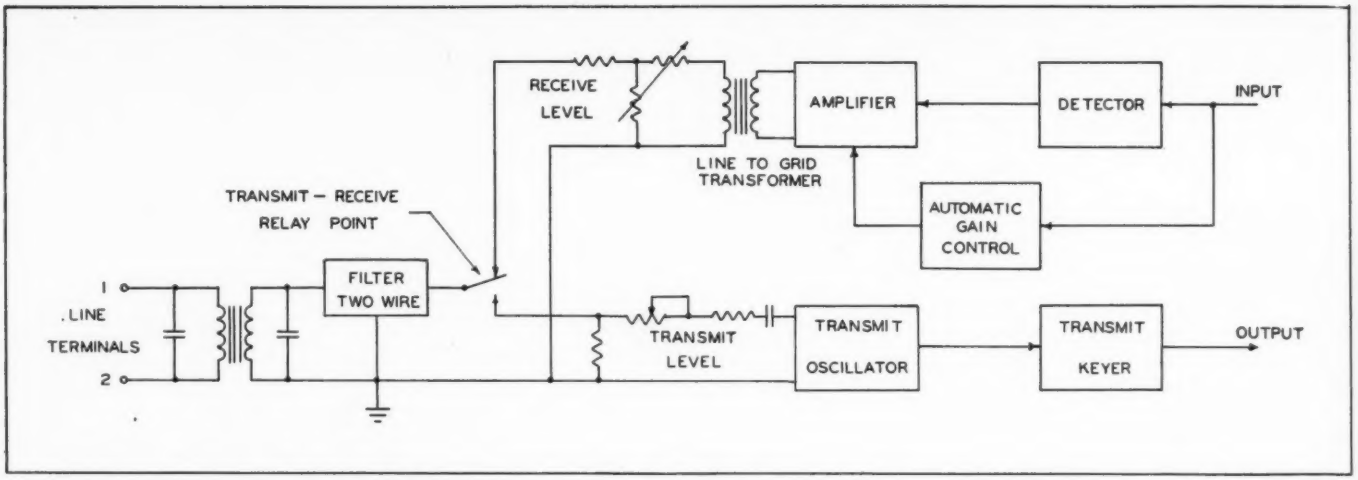
Get the full IBM 305 RAMAC story now. Just phone your local IBM representative. Or write: COMMUNICATIONS DEPARTMENT A57-b, International Business Machines Corporation, 590 Madison Avenue, New York 22, New York.

*Random Access Method of Accounting and Control

DATA PROCESSING
ELECTRIC TYPEWRITERS
TIME EQUIPMENT
MILITARY PRODUCTS

60 1897-1957 *Years of Independent Telephony*

IBM DATA PROCESSING



This is a block diagram of the IBM data transceiver. The circuit features both manual and automatic gain control, so it will work over a considerable range of telephone line conditions. (Drawing by Victor Willard.)

than —30dbm on any channel or the noise level may cause errors.

A circuit which has high impulse noise cannot give satisfactory results, and it must be recognized that noise measuring sets and meters cannot measure such impulse noise accurately. The sluggish response of such instruments prevents recognition of sharp noise bursts or transients. A cathode ray oscilloscope is usually used for impulse noise measurements.

Ringing Trouble

In addition to the problems which can occure with echo suppressors and compandors, systems which use 1,000-cycle ringing may develop another kind of trouble when used with IBM transmissions.

Depending on the operating levels, the sensitivity and discrimination of the 1,000-cycle ringing equipment, some IBM signals may trigger false ringing in this apparatus, which could interrupt the data transmission. This can create quite a problem which may require reduction of the sensitivity of the ringing equipment, or the use of special switching equipment to get it off the line during data transmissions.

Data Subset

One approach to the rapid and efficient transmission of business machine data is an experimental subset being developed by the Bell System. This is a device by which the information from a business machine—anything from an electric typewriter to an electronic brain—could be placed on magnetic tape and then sent over a telephone line at 1,000 words per minute onto a magnetic tape at the receiving end.

Thus, a typist might write up a lengthy document on a machine which would put out a magnetized tape as well as a paper copy. After the copy was checked, the tape could be put in the sending machine, the distant number dialed up and the whole works sent to the other end of the line at a speed 16 times faster than a teletypewriter.

The system presently developed uses a band of from 700 to 1,700 cycles. The message is recorded as magnetized spots on a tape according to a seven-position code. The code for a unit of data would use seven positions on the tape. Magnetizing a spot in one direction would stand for a "one," in the other direction for a "zero" in the binary system. However, as an error checking mechanism, every code might have either three or five ones. These ones would have to be received or the receiver would reject the signal.

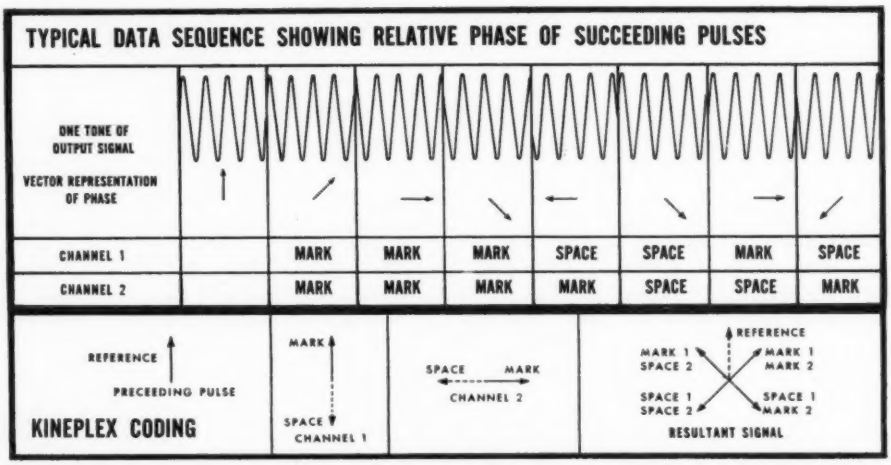
This is one of Bell System's automatic electrical typewriters and experimental equipment for use of magnetic tapes to store data for transmission.—Photo courtesy of *Bell Laboratories Record*.

This type of a system could be used on a leased line during off hours, and if left to run all night, for instance, could transmit as much information as 30 typists could write in an eight hour day.

Another new development in data transmission systems is the "Kineplex" a product of the Collins Radio Co. Recognizing that teletype, business machine, facsimile and other systems of communication use a form of pulse code modulation, Collins has devoted efforts to finding means of handling such signals with minimum power and bandwidth.

Originally teletype was transmitted by sending on and off type of signals. Later, frequency shift was developed,

(Please turn to page 86)



Typical data sequence showing relative phase of succeeding pulses in Kineplex.

Butyrate conduit is joined easily

Using slip-sleeve couplings and solvent cement, two Kingsport Utilities crewmen laid 247 feet of a "white way" line in only 20 minutes—a fraction of the time it would take with conventional materials.

Butyrate conduit curves without fittings

To follow ditch contours in this installation, Brookville Telephone Company, Brookville, Indiana, used semi-rigid conduit of Tenite Butyrate—and eliminated the need for many right angle fittings.

You get extra advantages with conduit of Tenite Butyrate plastic

Conduit made of Tenite Butyrate plastic is ideally suited for your operations.

It has a horn-like toughness and high impact strength. It is unaffected by corrosive and electrolytic action of soil, and is non-inductive. It can be handled, cut and joined with ease. It has glass-smooth walls for easy cable pull-through.

But conduit made of Tenite Butyrate also offers unique qualities not found in any other cable conduit.

It is semi-rigid. This allows the engineer to plan many direction changes—*without fittings*. It is available in long 20-foot lengths to reduce the number of joints in your line. It is extremely light in weight; a length of 4" conduit weighs only 20 lbs.

For more information and the names of manufacturers supplying conduit made of Tenite Butyrate plastic, return the coupon below.

1932—EASTMAN'S 25TH YEAR IN PLASTICS—1957

Butyrate conduit resists corrosion

Tenite Butyrate was chosen by Community Public Service Company as the duct material to successfully combat the strong alkali soils found in the Pecos, Texas area.

TENITE
BUTYRATE
an Eastman plastic

EASTMAN CHEMICAL PRODUCTS, INC.
subsidiary of Eastman Kodak Company, Kingsport, Tennessee

Please send me information on cable conduit made of Tenite Butyrate and a list of companies manufacturing Butyrate conduit and fittings.

NAME_____

POSITION_____

COMPANY_____

STREET_____

CITY_____ ZONE_____ STATE_____

DEPARTMENT OF TECHNOLOGY
BUFFALO AND ERIE COUNTY PUBLIC LIBRARY

XUM

TELEPHONY'S Traffic Engineering Handbook

By Gilbert R. Brackett

Nov. 30, 1957

Part 6 (Continued)

PBX Central Office Two-Way Trunks

The number of central office trunks required should be sufficient to carry the two-way traffic between the PBX and the telephone company's central office. If practical, all central office trunks should be included in one two-way group. However, there will be cases where the size of the trunk group or the needs of the particular PBX will indicate the desirability of two separate one-way groups, one for outgoing and one for incoming traffic, or a one-way group for outgoing and a two-way group to be used mainly for incoming traffic, but also available for outgoing calls. The number of two-way central office trunks required can be determined in the following manner:

Assume that the busy-hour outgoing calls to the central office trunks to be 27 and that the trunk holding time averages 123 seconds per call.

27 calls × 123 seconds = 3,321 total holding time seconds.

3,321 seconds ÷ 100 = 33.21 one hundred second calls (CCS).

Now, also assume that the incoming busy-hour trunk calls from the central office to be 260 and their holding time as 140 seconds per call.

260 calls × 140 seconds = 36,400 total holding times seconds.

36,400 seconds ÷ 100 = 364 one hundred second calls (CCS).

And, so, in the in-and-out CCS on the two-way central office trunks would add up to:

33 CCS + 364 CCS = 397 CCS.

Referring to the accompanying "Trunk Capacity Table," sub-table 10, we find that 397 CCS will require 20 trunks. This number of central office two-way trunks should be provided between the PBX and the central office.

Incoming central office trunks are read directly from the "Trunk Capacity Table," using the sub-table headed by the grade of service applicable to the particular office under study.

Repeaters

For connections between lines working out of the same office, or out of two offices located in the same building, the switches composing the train are relatively close together, therefore, it is economical to provide the regular three-wire trunks all the way from the line switch or line-finder to the connector. But, should the office be located in two separate buildings, possibly several miles apart, the length of such trunks might prevent the dial pulses from satisfactorily operating a selector or connector over such a trunk in series with a long subscriber loup. Also, it is often impossible, at least not economical, to operate the holding circuit over the third wire (or "S" lead).

In such cases a "repeater" is interposed at the originating end office between the last selector and the outgoing end of each trunk to a distant office.

Hundred Call Seconds and Per Cent Use at Various Service Levels for Group Sizes of 1 to 50

The table number indicates the number of calls per 1000 encountering all equipment in the group busy

Trunks	TABLE 1		TABLE 5		TABLE 10		TABLE 20		TABLE 30		TABLE 40		Trunks
	CCS	% Usage	CCS	% Usage	CCS	% Usage	CCS	% Usage	CCS	% Usage	CCS	% Usage	
1	.1	.1	.2	.5	.4	1.0	.7	2.0	1.1	3.1	1.5	4.2	1
2	1.6	2.3	3.7	4.8	5.4	7.5	7.9	10.9	9.7	13.5	11.3	15.7	2
3	6.9	6.4	12.2	11.3	15.7	14.5	20.4	18.9	24.0	22.2	26.9	24.9	3
4	15.4	10.7	24.2	16.8	29.6	20.6	36.7	25.5	41.6	28.9	45.7	31.8	4
5	26.6	14.8	38.9	21.6	46.1	25.6	55.8	31.0	61.6	34.2	66.6	37.0	5
6	40.0	18.5	55.4	25.7	64.4	29.8	76.0	35.2	82.8	38.3	89.3	41.3	6
7	54.7	21.7	73.4	29.1	83.9	33.3	96.8	38.4	105	41.7	112	44.4	7
8	70.9	24.6	92.5	32.1	105	36.5	119	41.3	129	44.8	137	47.6	8
9	88.2	27.2	113	34.9	126	38.9	142	43.8	153	47.2	162	50.0	9
10	107	29.7	134	37.2	149	41.4	166	46.1	178	49.4	188	52.2	10
11	126	31.8	156	39.4	172	43.4	191	48.2	204	51.5	214	54.0	11
12	145	33.6	178	41.2	195	45.1	216	50.0	230	53.3	240	55.6	12
13	166	35.5	201	42.9	220	47.0	241	51.5	256	54.7	267	57.1	13
14	187	37.1	224	44.4	244	48.4	267	53.0	283	56.1	295	58.5	14
15	208	38.5	248	45.9	269	49.8	293	54.3	310	57.4	322	59.6	15
16	231	40.0	273	47.4	294	51.1	320	55.6	337	58.5	350	60.8	16
17	253	41.3	297	48.5	320	52.3	347	56.7	365	59.6	378	61.8	17
18	276	42.6	322	49.7	346	53.4	374	57.7	392	60.5	407	62.8	18
19	299	43.7	347	50.7	373	54.5	401	58.6	420	61.4	436	63.8	19
20	323	44.9	373	51.8	399	55.4	429	59.6	449	62.4	465	64.6	20
21	346	45.8	399	52.8	426	56.4	458	60.6	478	63.2	494	65.3	21
22	370	46.7	424	53.5	453	57.2	486	61.4	507	64.0	523	66.0	22
23	395	47.7	451	54.5	480	58.0	514	62.1	536	64.7	552	66.7	23
24	419	48.5	477	55.2	507	58.7	542	62.8	564	65.3	582	67.4	24
25	444	49.3	504	56.0	535	59.4	571	63.4	593	65.9	611	67.9	25
26	469	50.1	531	56.7	562	60.1	599	64.0	623	66.6	641	68.5	26
27	495	50.9	558	57.4	590	60.7	627	64.5	652	67.1	671	68.9	27
28	520	51.6	585	58.0	618	61.3	656	65.1	682	67.7	701	69.6	28
29	545	52.2	612	58.6	647	62.0	685	65.6	711	68.1	731	70.0	29
30	571	52.9	640	59.3	675	62.5	715	66.2	741	68.6	762	70.6	30
31	597	53.5	667	59.8	703	63.0	744	66.7	771	69.1	792	71.0	31
32	624	54.2	695	60.3	732	63.6	773	67.1	801	69.5	822	71.4	32
33	650	54.7	723	60.8	760	64.0	803	67.6	831	69.9	852	71.7	33
34	676	55.2	751	61.4	789	64.5	872	68.0	861	70.3	883	72.1	34
35	703	55.8	779	61.8	818	64.9	862	68.4	891	70.7	913	72.5	35
36	729	56.3	807	62.3	847	65.4	892	68.8	922	71.1	944	72.8	36
37	756	56.8	836	62.8	878	65.8	922	69.2	952	71.5	975	73.2	37
38	783	57.3	864	63.2	905	66.2	952	69.6	982	71.8	1006	73.5	38
39	810	57.7	892	63.5	935	66.6	982	69.9	1013	72.1	1037	73.9	39
40	837	58.1	921	64.0	964	66.9	1012	70.3	1043	72.4	1069	74.2	40
41	865	58.6	950	64.4	993	67.3	1042	70.6	1074	72.8	1099	74.4	41
42	892	59.0	979	64.7	1023	67.7	1072	70.9	1104	73.0	1130	74.7	42
43	919	59.4	1008	65.1	1052	68.0	1103	71.3	1135	73.3	1161	75.0	43
44	947	59.8	1036	65.4	1082	68.3	1133	71.5	1166	73.6	1192	75.3	44
45	975	60.2	1066	65.8	1112	68.6	1164	71.8	1197	73.9	1223	75.5	45
46	1003	60.6	1095	66.1	1142	69.0	1194	72.1	1228	74.2	1255	75.8	46
47	1030	60.9	1124	66.4	1171	69.2	1225	72.4	1259	74.4	1286	76.0	47
48	1058	61.2	1153	66.7	1201	69.5	1255	72.6	1291	74.7	1317	76.2	48
49	1086	61.6	1183	67.1	1231	69.8	1286	72.9	1322	74.9	1349	76.5	49
50	1115	61.9	1212	67.3	1261	70.1	1317	73.2	1353	75.2	1381	76.7	50

Trunk Capacity Table

Such a repeater has relays which are energized by dial pulses from the calling station, producing facsimile dial pulses on the trunk and so operate the associated selectors and connectors at the distant office.

Battery for dialing and talking is furnished the calling station through a relay at the repeater. Supplying talking battery from the repeater to the calling party insures more uniform transmission than would be the case if the connector in the distant office were the source of supply.

The average outgoing repeater will not always retransmit the dial pulses with the same precision that a dial gives. On a very long trunk loup, the distortion of the pulses may be increased to a point where the distant switches will no longer function. When this happens, a special repeater, called a "pulse correcting repeater," is added to the incoming end of the trunk. This repeater will replace the distorted incoming pulses by new pulses which will operate the switches properly.

(Part 6 to be continued next week)

XUM

LABORATORY TESTS PROVE "OLDEST" POLES STRONG, SOUND

New evidence of Creosote's long-term effectiveness given by 63-year old poles

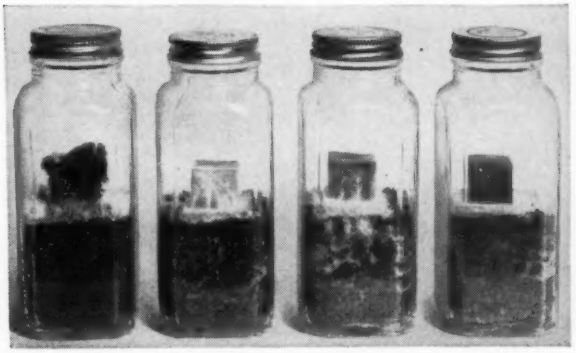
The English telephone poles found in service after 63 years are the oldest documented case history of pole life yet uncovered. In investigating the properties of both the poles and their creosote preservative, Koppers Tar Products Division enlisted the cooperation of the Forest Products Laboratory, U. S. Department of Agriculture, at Madison, Wisconsin. The results of various tests on the old poles by this independent authority are summarized in the legends below the photos shown here.

These test results, coupled with the excellent external appearance of the 63-year old poles, illustrate the lasting protection given by creosote. Since spectrographs have shown modern creosote and the 63-year old creosote to be almost identical, modern users of pressure-creosoted wood are assured of this same protection.

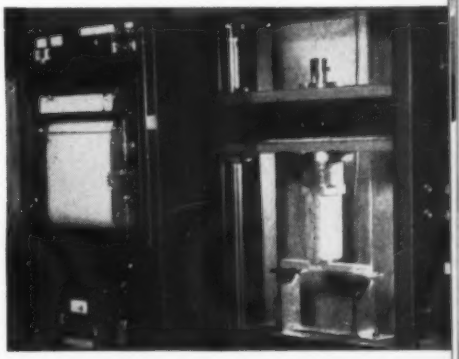
Why take a chance on less effective preservatives? Where wood must *last*, specify the clean, unequalled protection of pressure-treatment with creosote, the 50-year plus preservative.

Use the coupon below to get your copy of the Creosote Fact-Finder, with a full report on these laboratory tests!

Extraction tests showed preservative retention varied from an average 1.3 lb./cu. ft. for air-exposed portions to 11.1 lb./cu. ft. near the butt. Original treatment was probably 12 lb., full-cell.



Soil block tests with creosote extracted from the old poles revealed that considerable toxicity still remained, even after 63 years exposure. Photo shows decreasing degree of fungus attack with retentions of the old creosote varying from .34 lb. (left) to 6.3 lb. (right).



Strength tests of below-ground specimens showed an average strength for the pressure-creosoted wood as high as expected for freshly-cut wood of the same species and density.

CREOSOTE . . . *the modern preservative with a proved record*

KOPPERS

CREOSOTE

TAR PRODUCTS DIVISION

Pittsburgh 19, Pa.

Koppers Company, Inc., Tar Products Division
1450 Koppers Bldg., Pittsburgh 19, Pa.

Please send me the CREOSOTE FACT-FINDER.

Name_____

Company_____

Address_____

City_____ State_____

DEPARTMENT OF TECHNOLOGY
BUFFALO AND ERIE COUNTY PUBLIC LIBRARY

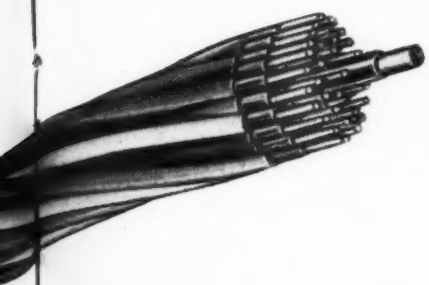
Want High Quality

Whitney Blake can fill ALL your needs

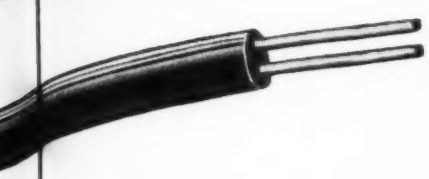
WB

WB has that which so many others have yet to gain . . . EXPERIENCE

DISTRIBUTION WIRE?



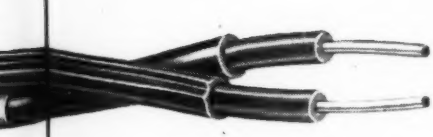
MULTI-PAIR DISTRIBUTION WIRE . . . Self supporting, available in 3, 6, 11 and 16 pair No. 19 AWG copper, polyethylene insulation and color-coded polyvinyl chloride covering.



PARALLEL DISTRIBUTION WIRE . . . Self supporting, available in extra high strength 30% Copperweld No. 14 AWG and .080". Insulated with WB special, tough black polyethylene compound.

TELEPRENE® DISTRIBUTION WIRE . . . Self supporting, available in No. 14 and No. 16 AWG hard copper conductors rubber insulated and neoprene jacketed.

ARMORED TELESEAL DISTRIBUTION WIRE . . . For direct burial, in No. 16 AWG soft copper conductors with specially developed, low moisture absorbing rubber insulation. Served armor of flat steel wires, neoprene jacket.



TELESEAL® DISTRIBUTION WIRE . . . For direct burial, available in No. 16, No. 14, or No. 12 AWG hard copper conductors, specially developed, low moisture absorbing rubber insulation, neoprene jacketed.

WHITNEY BLAKE has a complete line of distribution wire to serve the Independent Telephone Industry no matter what the need may be.

From one source — WHITNEY BLAKE — telephone companies can fill all their requirements with assurance of one high standard of quality . . . quality that has again and again demonstrated that the best wire — the longest lasting wire — is far more economical than a lower priced, short lived wire that needs early replacement.

WHITNEY BLAKE telephone wires are made by experienced wire makers and have proved their value in years of long service across the nation.

60 YEARS OF INDEPENDENT TELEPHONY
INDEPENDENT
1897 — 1957

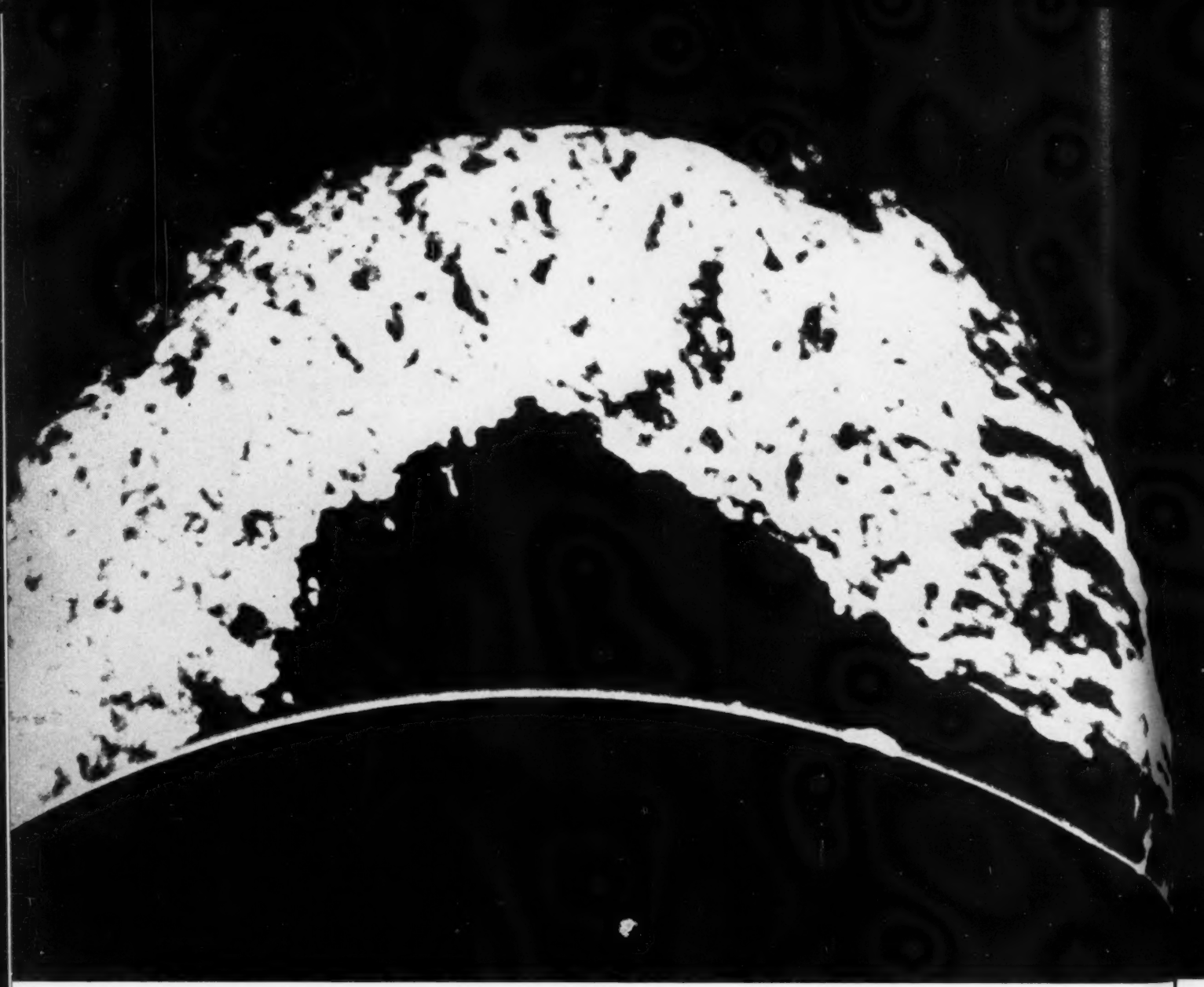
Well Built Wires Since 1899

©1957

WHITNEY BLAKE COMPANY

NEW HAVEN 14, CONNECTICUT

XUM



Among the many spectacular scenes in the film are actual motion pictures of a giant solar explosion photographed during an eclipse.

Some Press Comments

". . . a triumph of informational wizardry . . . " *Christian Science Monitor*

". . . a long step forward in enlightened use of television." *New York Times*

". . . thought-provoking and stimulating." *Baltimore Sun*

". . . one of the season's most interesting documentaries . . . " *San Francisco Chronicle*

". . . wonderfully informative and entertaining." *Cincinnati Enquirer*

XUM

On TV again—

"OUR MR. SUN"

Bell System Science Show returns on NBC-TV at 5:30 p.m., E.S.T., Sunday, December 15

Back by popular demand! "Our Mr. Sun," one of the most fascinating shows ever televised—and now one of the most famous—will return to your screen soon. If you missed it the first time, here's your chance to see the exciting story of the sun and its enormous effect on our planet. (This unique presentation is worth seeing a second time, too!)

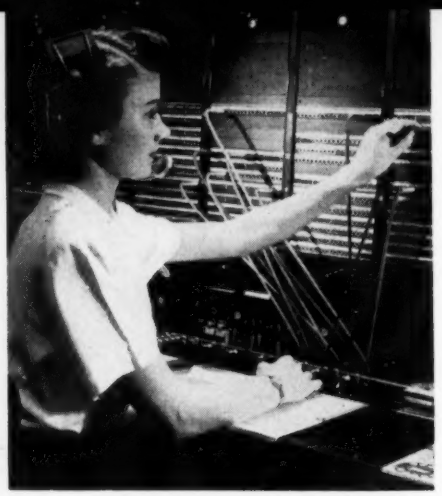
"Our Mr. Sun" is a film of great appeal, thanks to a lucid, entertaining script, imaginative photography and ingenious cartoon animation. Five well-known scientists helped develop the program, and it was reviewed and approved by a distinguished Scientific Advisory Board. Frank Capra, winner of three Academy Awards, was producer and director, and the stars are Eddie Albert and Dr. Frank Baxter.

This widely acclaimed film is one of a series designed to stimulate the interest of students and the general public in scientific subjects. This should be helpful to the telephone industry and to the whole country. Why not make a date to see "Our Mr. Sun" when it returns on December 15? And be sure to include the children. Your local newspapers will give you the time and station in your community.

WORKING TOGETHER TO BRING PEOPLE TOGETHER

BELL TELEPHONE SYSTEM

XUM



THE Operator's Corner

By MAYME WORKMAN — TRAFFIC EDITOR

IT IS A NATURAL, human desire to wish to be appreciated. For our friendship, the work we do, the effort we put forth to overcome a difficulty. When we put forth a special effort to please, in our work or in our contact with our friends, just a little comment of appreciation is all we ask for our effort. When it is not forthcoming, or when it is taken for granted, we are disappointed and the joy we experienced in putting forth the special effort is dimmed.

Take our work, for example. An operator may have difficulty in handling a particular type of call. She works very hard to overcome this difficulty and finally succeeds. Does her supervisor or chief operator comment on her success? Give her a little word of praise, or just let her know they have observed her effort? If not, the operator may be disappointed and wonder why she worked so hard to overcome the fault.

It is just as important to observe good work as to point out inaccuracies. If we withhold praise, when praise is due, but never fail to tell an operator when she has erred, she may become discouraged and imbued with the feeling, "She never thinks I do anything right!" A word of praise costs so little and does so much.

Occasionally it is well to remember we are selling service, the only product we have to offer, and it takes a well organized team to do a good job, the experienced and inexperienced operators, the supervisors, the chief operator. All play an important role in doing a good job.

In a large organization there are many who will always be operators. Perhaps by choice or because they are doing a good job where they are and they are kept on that job. Then too, the supervisory people are the minority in the team. We need less of them. Each person in the team is important and has her responsibility in rendering pleasing and satisfactory telephone service.

No matter what your position may be, it is up to you to make it an important one. If you are an operator, you should strive to be the most efficient one on the team. You have an important job to do, a job that is just as important to you and to the service as the supervisor or chief operator's position. Never minimize the importance of your job.

In a large organization there are many people who apparently go unnoticed. They are on the job every day at the hours assigned to them, faithful and loyal workers, and they may sometimes wonder, "Just how important am I?" Well, if you are a telephone operator, rest assured, *you are very important.*

As an operator, you may think your job is a small job, that you are just a little person in a big team. Perhaps, but it takes a combination of many "little persons" to get the job done.

The other day I read an article in the "National News" of the American Legion Auxiliary entitled, "Volunteer Service." The title caught my eye, particularly the word, "Service." After reading the article I thought it was applicable to many persons I have known in the telephone industry. You may enjoy reading it, too.

VOLUNTEER SERVICE

There are many ways of serving,
  Some strive for the trumpet's blare;
Some think a service not deserving
  Without notice and fanfare.

Others work in lowly places
  Doing small jobs with delight,
Bringing smiles to worried faces,
  Cheering all with friendship's light.

So it's not the "how" or "wherefore"
  That will give us "Brags" so fine;
It's the fact of friendly service—
  Low or high up—down the line.

Let us then keep up our service,
  Build, expand it as we go.
Doing it ourselves, but *doing*
  Then we'll brag that that is so.

'Tis not often that the leader
  Earns, alone, the laurel crown;
'Tis the little people "under"—
  Working so hard they've just
    "stayed down."

But there is a record somewhere,
  Angels write it, deep and sure;
All we give in service, selfless,
  Make a Heavenly "Brag" endure.

If we take our stand on the solid rock of service, the indomitable foundation of usefulness, the huge world will turn up for us every day, some opportunity to attract all of our ability and ambition.

Traffic Questions

(1) What is the abbreviation for "community dial office?"

(2) How should a CDO trunk Signal be answered at "Operator" office?

(3) How should a call be advanced to a CDO telephone?

(4) How should the operator proceed when a call for CDO telephone is received at Inward Board?

(5) When an alarm condition from a CDO occurs on one of the "Operator" trunks or on an alarm trunk, how should the operator proceed?

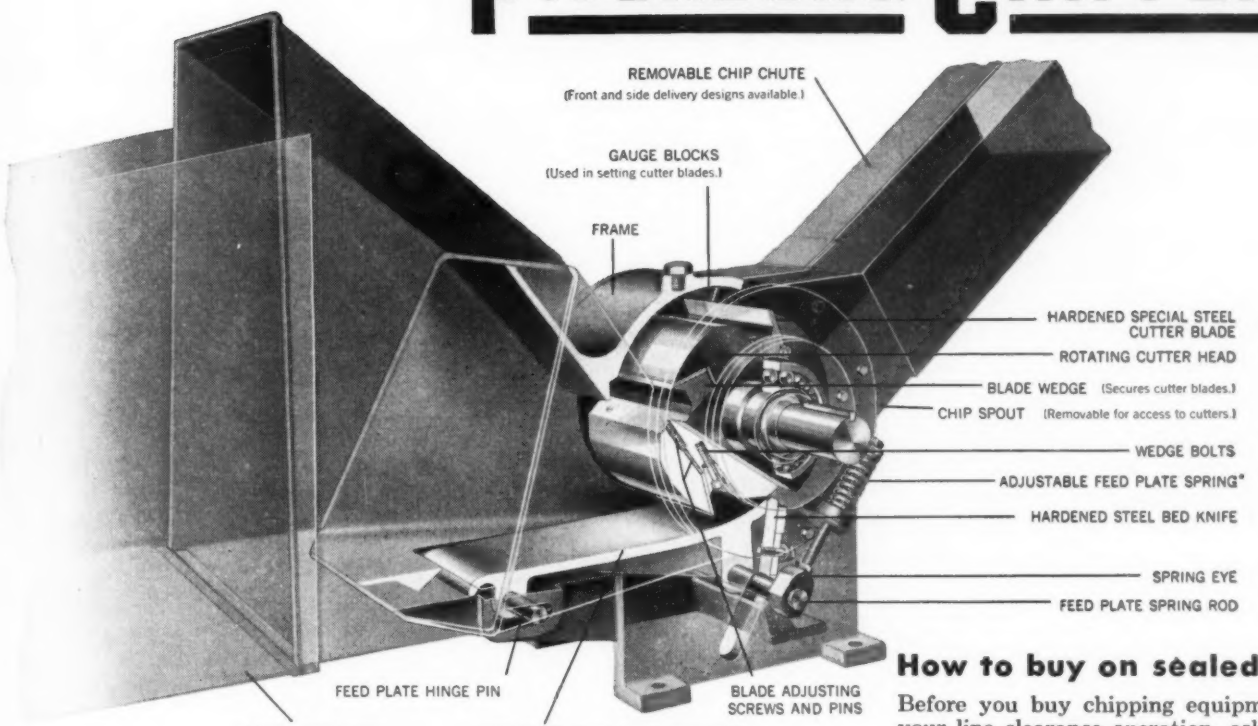
Answers are presented on page 89.

Can't Compete

"A recent study based on government records indicates that if TVA were required to pay the going rate of interest for its money, and to pay taxes on the same basis as private power companies, it would have to increase its revenues by 90.9 million dollars a year —which would mean an over-all increase in its power rates of 41 per cent. Finally, it should be remembered that TVA was supposed to be a fair yardstick of the rates charged for power service generally. Some yardstick!"—*Industrial News Review.*

Here's the inside story of time-saving, labor-saving

FITCHBURG CHIPPERS


REMOVABLE CHIP CHUTE
(Front and side delivery designs available.)
GAUGE BLOCKS
(Used in setting cutter blades.)
FRAME
HARDENED SPECIAL STEEL CUTTER BLADE
ROTATING CUTTER HEAD
BLADE WEDGE (Secures cutter blades.)
CHIP SPOUT (Removable for access to cutters.)
WEDGE BOLTS
ADJUSTABLE FEED PLATE SPRING*
HARDENED STEEL BED KNIFE
SPRING EYE
FEED PLATE SPRING ROD
FEED PLATE HINGE PIN
BLADE ADJUSTING SCREWS AND PINS
LARGE FEED APRON
(Protects operator from cutters. Folds up when not in use.)
FEED PLATE (*U.S. PAT. NO. 2634062)
(Spring operated feed plate automatically adjusts for different sized material and reduces horsepower requirements.)

GET FULL SPECIFICATIONS—*Know what you buy*

SPECIFICATIONS: FITCHBURG CHIPPER *(unit guaranteed for workmanship and material for one year.)*

CHIPPING UNIT — MODEL (Trailer Type)	TWC-6	TWC-612	TWC-9	TWC-915
Diameter of cutter head	9½"	9½"	11½"	11½"
Length of cutter head body	6"	12"	9"	15"
Number and length of cutter blades	4—6⅜"	4—12⅜"	4—9"	4—15"
Type of blade	Special High-Chrome, High-Carbon Tempered Steel			
Cutter head shaft size, (diameter)	1¾"	1¾"	2½"	2½"
Shaft keyway size	⅜" x 3/16"	⅜" x 3/16"	⅜" x 5/16"	⅜" x 5/16"
Approximate weight of chipper only	415#	650#	630#	1,000#
Maximum knife setting	¼"	¼"	⅜"	⅜"
Capacity—maximum size round (limbs, etc.)	4½"	4½"	7"	7"
maximum size width (slabs, etc.)	6"	12"	8½"	14½"

All units equipped with exclusive *Fitchburg Safety Spring*-activated feed plates (U.S. Patent No. 2634062)

POWER UNIT — Gasoline fuel.				
Number of cylinders	4	6	6	6
Cu. In. Piston Displacement	162	226	226	251, 330, or 427
Water Cooled	Yes	Yes	Yes	Yes
Electric starter and generator	Yes	Yes	Yes	Yes
Clutch Power Take-Off	Disc Clutch	Disc Clutch	Disc Clutch	Disc Clutch
Battery	6-volt	6-volt	6-volt	6-volt
Governor	Var. speed	Var. speed	Var. speed	Var. speed
Oil level and pressure gauge	Yes	Yes	Yes	Yes
Water temperature gauge	Yes	Yes	Yes	Yes
Ammeter	Yes	Yes	Yes	Yes
Key ignition switch	Yes	Yes	Yes	Yes

Power Units are the enclosed type, with industrial engines of proper horsepower and torque ratings.

TRAILER UNIT. All welded steel construction. Steel I-Beam axle. Steel hubs with roller bearings. Drop forged ring-type tow bar to fit Army-type pintle hook. Safety chains. Front and rear legs, front retractable jack-type with steel caster, rear adjustable for height. Automotive drop-center type wheels. 6-ply Commercial pneumatic tires, ranging from 6.00 x 16 to 7.50 x 16 6-leaf springs of 3,500# capacity. Trailer equipped with combination tail light and number plate bracket, with tail light operated by toggle-switch on motor panel (stop light furnished when required). Tire tread widths range from 63" on TWC-6 to 72½" on TWC-915. Fenders and tool boxes are standard equipment. **EQUIPMENT.** Proper sheaves and high-capacity v-belts. Feed apron, chip spout, side delivery chute, 2-piece truck loading chute with chip deflector. Belt guard. Extra set of cutter blades with each unit. Tools furnished consist of necessary Allen wrenches, handle, 3 gauges, honing stone, can of grease, grease gun adapter. Operating and parts manuals. Fitchburg Chippers supplied with standard gray paint unless otherwise requested.

Specifications subject to change without notice

Some of the many uses for your Fitchburg Chipper: **STORM DAMAGE • PARKS • ROADSIDE CLEARANCE • CHRISTMAS TREE DISPOSAL • DUTCH ELM DISPOSAL • SHADE TREES TRIMMINGS • HIGHWAY CONSTRUCTION**

FITCHBURG ENGINEERING CORPORATION
FITCHBURG, MASSACHUSETTS

How to buy on sealed bids

Before you buy chipping equipment for your line clearance operation, ask for *all* the facts. Get full specifications and compare. Fleet owners tell us that often when they select a Fitchburg Chipper, a smaller model can do the work required. Remember, too, that *only* Fitchburg Chippers are sold with a written ONE YEAR GUARANTEE.

Fitchburg Chippers provide extra *safety in operation*. The exclusive *Fitchburg Safety Spring* assures ease in chipping all wood sizes to the machine's rated capacity. This spring-activated feed plate "gives" with material entering the chipper—protecting the operator in case metal or other foreign material is accidentally fed. Another exclusive feature is the hinged feed apron which can be closed when chipper is not in operation.

Fitchburg Chippers have no heavy fly wheels with their warm up period and resulting disadvantages in start-stop operation. Consequently, there is no danger of clutch strain or frequent bearing failure. Ask your Fitchburg Chipper distributor to arrange a demonstration.

COUPON BRINGS FREE DATA

Get the facts—get them now. There is no obligation, mail this coupon today.

FITCHBURG ENGINEERING CORPORATION
Fitchburg, Massachusetts, Dept. T-127

Send FREE Fitchburg Chipper Data.

(NAME) _____ (POSITION) _____

(ADDRESS) _____

(TOWN OR CITY) _____ (STATE) _____

DEPARTMENT OF TECHNOLOGY
BUFFALO AND ERIE COUNTY PUBLIC LIBRARY

XUM

DIALAPHONE

XUM

gives your subscribers push-button dialing!

With *Dialaphone* your subscriber makes calls faster, easier and more accurately. There's no hunting through a bulky directory. An indexed Directory Tape provides space for 850 separate listings. The subscriber simply turns a crank which spins the tape; when the name of the desired party appears in the View Frame, he presses the Starter Key and the call is completed *automatically*. The Directory Tape is prepared from a list which is supplied by the subscriber. Additional listings may be added to the tape at any time.

EQUIPPED FOR DDD

Because of the growing number of DDD (Direct Distance Dialing) installations using the nation-wide numbering plan, Dialaphone provides for up to 14 digits.

CHOICE OF 10 ATTRACTIVE COLORS!

We are now supplying the Dialaphone in all of our attractive telephone colors: Gardenia White, Camellia Pink, Forget-Me-Not Blue, Sunlight Yellow, Classic Ivory, Sand Beige, Garnet Red, Dawn Grey, Jade Green and Turquoise. We'll be glad to send you literature which gives further details. Call your Automatic representative or your nearest A. E. Sales Corporation warehouse.

STARTER KEY
After party has been selected —and dial tone heard—depress to start automatic dialing of call.

VIEW FRAME
Alphabetically indexed to provide quick finding of party.

HAND CRANK
Rotates Directory Tape through all five directory sections—Emergency, General, Classified, Long Distance and Frequent Use.

Automatic's 5 friendly warehouses:

George Ferguson, Mgr.
Northlake,
Illinois
Fillmore 5-7111

"Michie" Hester, Mgr.
2915 Moore St.
Richmond 21, Va.
ELgin 8-9280

Ed. J. Chok, Mgr.
2360 N. W. Quimby St.
Portland 10, Ore.
CApital 3-7244

Fran Batcher, Mgr.
158 Corliss Avenue
Johnson City, N. Y.
Binghamton 7-8507

Robert Miller, Mgr.
2021 Main St.
Kansas City 8, Mo.
HArrison 1-4720

AUTOMATIC ELECTRIC

A member of the General Telephone System—One of America's great communications systems

GENERAL SYSTEM

McKay Reviews Three New Electronic Books

"FUNDAMENTALS OF ELECTRON DEVICES," by Karl R. Spangenberg: 860 pages, illustrated.

It is refreshing to find a book on fundamentals which really deals with origins of the subject. The origins of the science of electricity lie in the subject of physics; in fact electricity was once taught as a branch of physics. The present age of specialization has resulted in fields of learning which explore applications only, and many science books might be said to have the same fault.

In this volume, however, electron devices are explained in their proper relation to the subject of physics. Over half of the book is devoted to the devices, the remainder to the application of them. Thus the emphasis is on electrons, atoms and ions, rather than on amplifiers and oscillators.

The first chapter deals with the structure of matter, and develops the basic electrical laws and formulas as a branch of physics. This is followed by chapters on electric and magnetic fields and on ion motion.

A long chapter then returns to basic physics with explanations of the atom, the molecule, Planck's constant and black-body radiation. Brief descriptions of the various experiments which were used to develop or prove the theories are given here.

Why some materials are conductors, some insulators, and some semi-conductors is explained in a thorough manner with appropriate illustrations. Although this is a college level text, and college mathematics are used throughout, the basic explanations of the states of matter are given in an easily understood manner. The electrical properties of metals, for instance, are described in terms of pinball machine operation.

After the basic treatment on the different actions of electrons in free space and in different forms of matter, the text approaches the application of these effects in electron devices. These are explained to be devices which include combinations of the various effects. This introduces the subject of junction effects.

Following this is a discussion on electron emission. Thus vacuum tubes and transistors are reached by a build-up through basic physics and the composition of matter, rather than the usual approach of working backwards from the electron device in an attempt to show how it works.

Applications of electron devices are taken only as far as basic circuits—oscillators, amplifiers and switching devices. Concluding chapters deal with photoelectric effects and noise limitations in electron devices. A series of appendices at the end of the book contain important formulas on basic relations. A large bibliography is also included which is keyed to the text.

The author of this work is professor of electrical engineering at Stanford University. F. E. Terman, who is consulting editor for this and other electronic engineering books is also of Stanford University.

This may account for the fact that this latest book has much of the flavor found in Terman's "Electronic and Radio Engineering" which is regarded by many as the bible of the electronic field. This style of writing is terse and to the point and requires close attention in reading, but gives its facts in easily digested capsules. While mathematics are extensively used, the word explanations of the principles are usually adequate for those who forgot most of their college math.

The Spangenberg text seems to follow this tradition, and is just the thing for engineers whose specialized work has taken them away from a basic understanding of what makes things tick. A person who thoroughly understands the principles laid down in this book is not likely to be baffled by any new device if it runs by electricity.

The book costs $10 and may be purchased from TELEPHONY.

•

"TRANSISTOR CIRCUITS," by Rufus P. Turner; 160 pages; $2.75 soft cover, $4.60 hard cover.

"Transistorized circuits have become so numerous that already their use is becoming 'customary'," reads the introduction to this book, and the author proceeds to present a collection of about 140 practical, workable circuits.

Every electronic technician needs a book of circuits, not only to understand existing principles, but to build new devices of his own. This volume offers one of the widest ranges of such circuits that are available. Here the transistor is no longer regarded as a freak and an element of gadgetry. Rather the attempt is to show circuits in a wide spread of applications which can actually be built and used.

There are full chapters on radio and audio amplifiers, DC amplifiers, oscillators and power supplies, and a collection of receiver circuits. There are also miscellaneous designs for Geiger counters, hearing aids and inter-com systems.

Of interest to telephone men are several circuits for triggers, switches and control devices, and a whole collection of test instruments that anyone can build. These include grid-dip oscillators, signal tracers, millivoltmeters and "sensitizers" for making existing instruments more sensitive.

The writing style is terse and complete. No words are wasted in theory; each circuit has a paragraph or two which simply and directly describes the circuit, the function of component parts, and performance data. This is in contrast to many circuit descriptions in other texts which leave out this information. The following paragraph describing a simple single stage amplifier, illustrates the approach:

"The figure shows the circuit of a typical common-base, transformer-coupled, singe stage amplifier employing a GE 2N45 transistor. This amplifier has been designed for 50,000 ohms input impedance and 500 ohms output impedance.

"Power output is 2 milliwatts and power gain is 500 times or 27 db. This means that an input signal driving power of 4 microwatts will give full output."

Which just about covers it. You can buy this book from TELEPHONY.

•

"STEREOPHONIC SOUND," by Norman H. Crowhurst; 128 pages; $2.25.

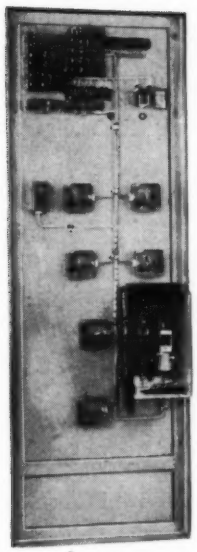
Ordinarily you wouldn't expect to read about a high fidelity book in a telephone magazine, except for the fact that telephone men are rabid hi-fi fans. However, this book has an additional appeal. Whereas about half of the pages have to do with stereophonic sound in the home and in the theater, of more interest to the telephone men are the chapters on sound and hearing.

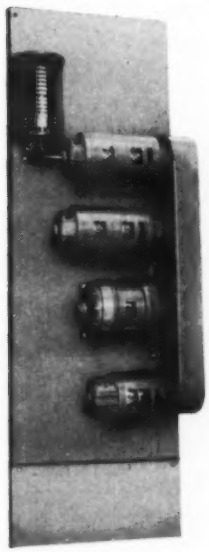
If you have wondered why your ears have a homing instinct that lets you tell the direction of some sounds and not of others, why you can screen out a friend's voice and ignore others in a noisy night club, or why a grand sounds different from an upright piano—this book has the answers.

The story is told in simple, easy to read style, with plenty of illustrations

(Please turn to page 84)

ESCO RINGING EQUIPMENT





MEMBER

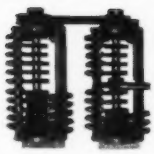
vertical mounting - factory prewiring saves space - simplifies installation

Here are two big points, typical of the practical considerations that go into the design of all Esco ringing equipment.

For new installations, conversions, or expanding present facilities, Esco vertical mounting, plus factory prewiring mean big savings in floor space and installation time and expense. These compact vertical assemblies fit standard rack installations for more efficient station arrangement and neat, modern appearance. Prewiring brings all exterior connections to a single terminal box for convenient connection to power and signal circuits. Color-coded lead identification is used throughout to make inspection or any later wiring changes quick and easy.

Before you make any commitments on new equipment, get the full facts on Esco vertical mounted - factory prewired assemblies. You'll see for yourself why so many equipment engineers and suppliers choose ESCO. Send for free brochure today.

"Ready-to-go" pre-wiring



Compact, accessible interrupters

Combination alternators

Lifetime drive motors

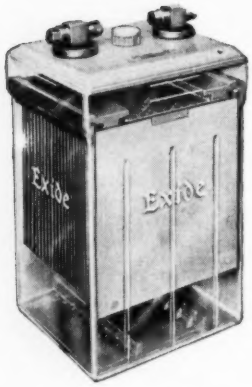
Screw adjusted pile-ups

Permanently aligned drives

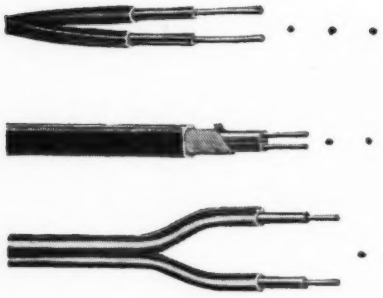
ADDITIONAL ESCO FEATURES (details in future ads in this series) explain why ESCO components are included in the installations of prominent suppliers like Automatic Electric Co., Federal Telephone and Radio Corp., Kellogg Switchboard Supply Co., Leich Sales Corp., Stromberg-Carlson Co.

ELECTRIC SPECIALTY CO.
176 South Street, Stamford, Connecticut

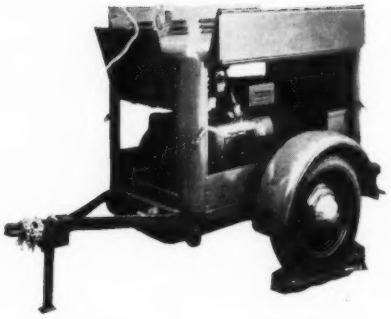
XUM



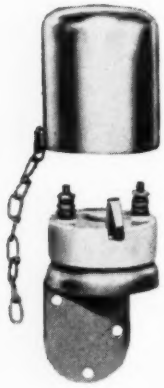
Big Capacity in Small Size. Unique positive plate in Exide-Tytex Battery has large area of active material that results in high capacity. Exclusive patented Silvium grid resists corrosion — prolongs battery life. Taperless plastic jars save one-third space. Exide Industrial Division, THE ELECTRIC STORAGE BATTERY COMPANY.



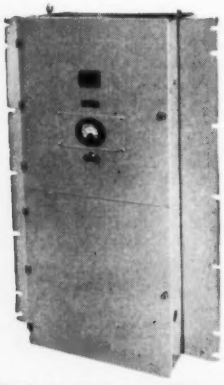
Afraid of Winter? Keep your lines in action—your maintenance costs down, with DIAMOND WIRE & CABLE CO.'s RED-D Drop Wire. Superior adhesion, conductivity, tensile strength. Available in Copperweld and Signal Bronze.



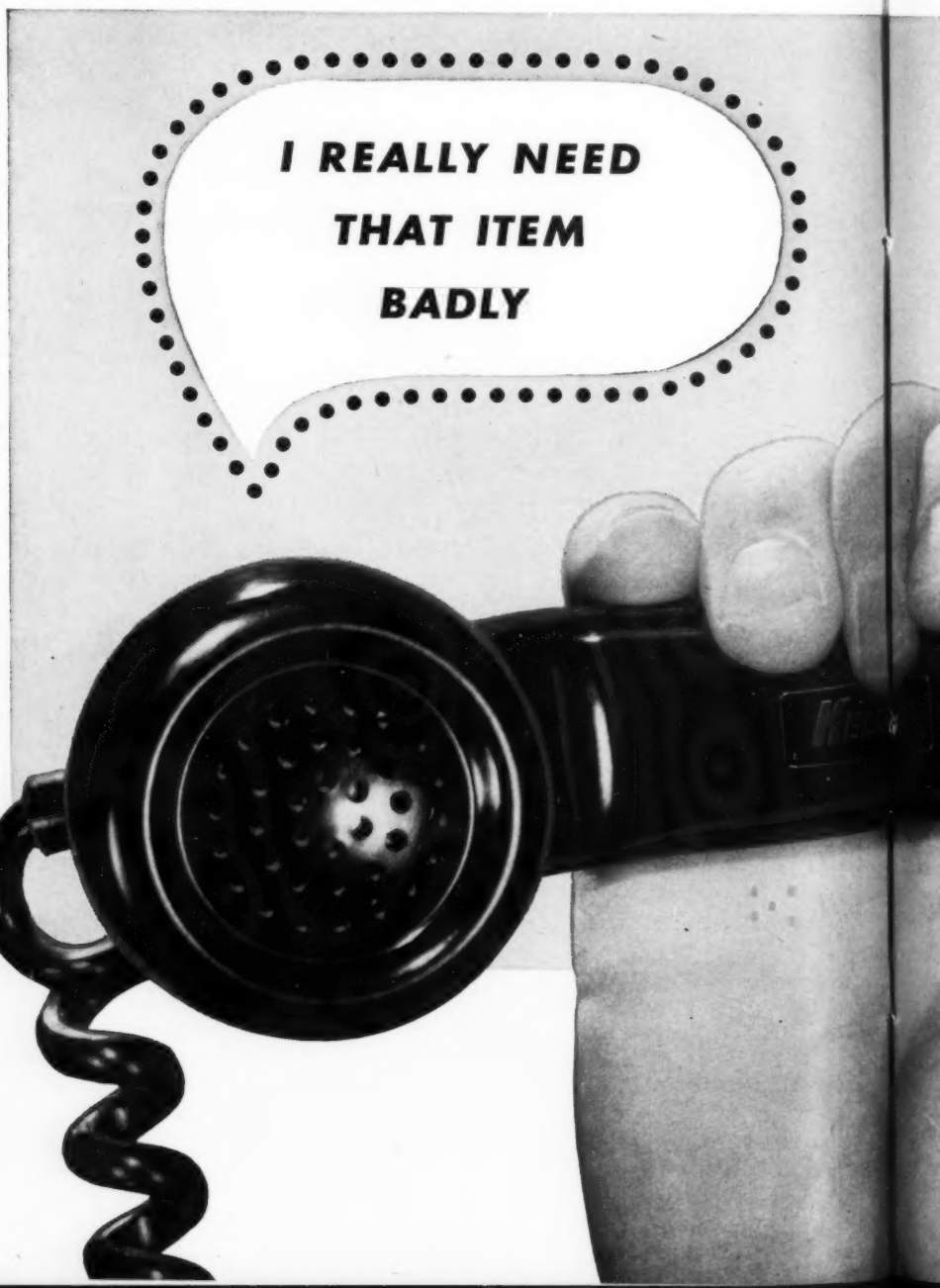
Maintenance Generator—Equipment includes toolbox, fuel tank, safety chain and chocks, taillight and reflectors, and sheet-metal house with hinged sides, hinged front cover. Available with or without generator —92" long, 53" wide, 51" high. With generator, weighs 800 lbs. S & G MANUFACTURING CORPORATION.

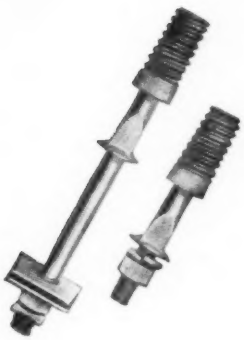


Developed for Better Insulation, the Cook Testerm Drop Wire Connector improves connecting and testing methods, occupies less space and provides terminating facilities for drop wire. Made by COOK ELECTRIC COMPANY.



New 48-Volt Battery Charger Line. Completely redesigned Raytheon Recti-Chargers (R) feature no load to full load regulation of ±1%, no tubes, automatic compensation for rectifier aging, no audible hum. Most compact units on the market—single and three phase, output from 3 to 400 amperes. RAYTHEON MANUFACTURING COMPANY.





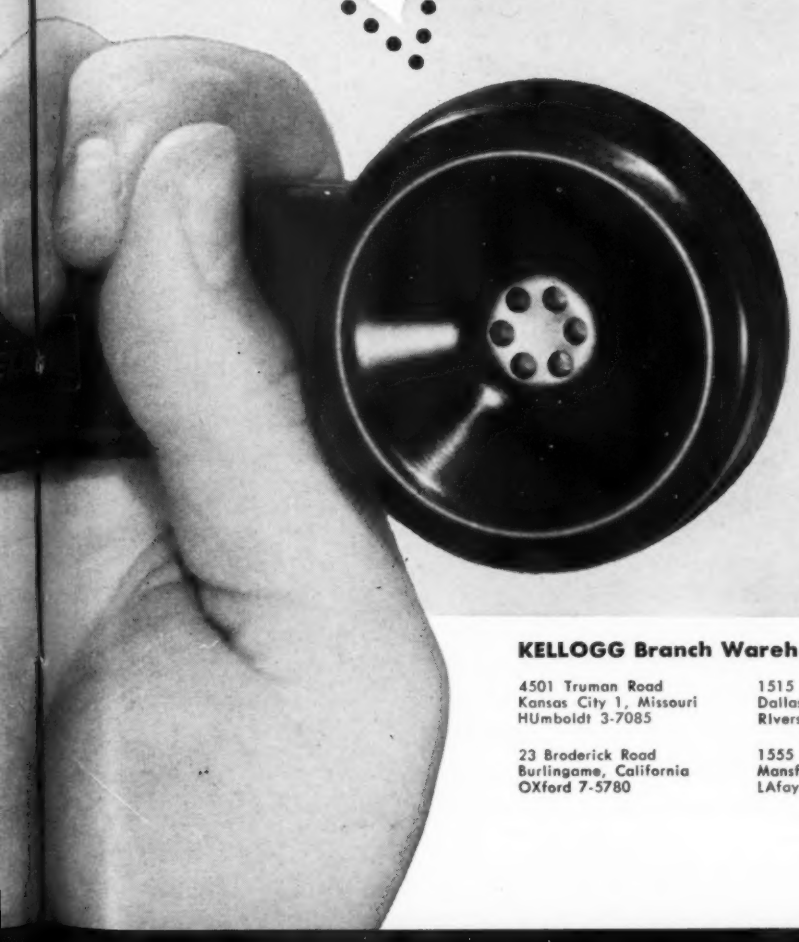
Joslyn R.E.A. Standard Wood Cob Steel Pins—Joslyn J1187 ⅝-inch Steel Pin is assembled with a J139 lock washer and square nut; the Joslyn J1188 pin has two 2" x 2" x ⅛" square washers, nut, and M-F locknut. Cobs are of seasoned Oak or Locust boiled in paraffin. Pins are forged, high carbon, open-hearth steel, hot dip galvanized.

JOSLYN MFG. & SUPPLY COMPANY.

Splicers Fibre Test Boards, excellent quality. Used for classifying pairs when testing out cable. Numbers are easy to read and will not wash off. Made by J. FRANK MOTSON COMPANY.

S-5 Sub-Cycle for Synchromonic ringing. Generates 30, 42, 54, and 66 cycles, plus a fifth frequency. Ringing frequencies are locked to the A-C line frequency. Provides maintenance-free operation. Made by LORAIN PRODUCTS CORPORATION.

WE HAVE IT IN STOCK
AND WE'LL SHIP IT TODAY



"We have it in stock and we'll ship it today." That's the answer that sounds so good when you need line supplies badly. And that's the answer you expect when you call Kellogg for emergency service. Kellogg has the largest inventory of telephone line supplies available . . . and Kellogg trained personnel are ready to give you fast service when you need it.

KELLOGG

A DIVISION OF IT&T

KELLOGG SWITCHBOARD AND SUPPLY COMPANY
A Division of International Telephone and Telegraph Corporation
Sales Offices: 6650 S. Cicero Ave., Chicago 38, Ill.

KELLOGG Branch Warehouses and Offices:

4501 Truman Road
Kansas City 1, Missouri
HUmboldt 3-7085

1515 Turtle Creek Blvd.
Dallas 7, Texas
Riverside 7-5191

1594 Southland Circle, N.W.
Atlanta, Georgia
Sycamore 4-2441

23 Broderick Road
Burlingame, California
OXford 7-5780

1555 West Fourth Street
Mansfield, Ohio
LAfayette 4-6511

165 Prospect Street
Passaic, New Jersey
Prescott 9-3610

New Addresses:

5924 S. Pulaski Road
Chicago 29, Illinois
REliance 5-7740

6100 Excelsior Blvd.
Minneapolis 16, Minnesota
WEst 9-6715-16

Announcing the New

YORK-HOOVER

model YMR-76 service body

Designed and Built to perform Service Jobs Faster, Safer, more Economically for You!

MODERN – PROVEN – EFFICIENT

- The Model YMR-76 is designed to provide more space for the convenient carrying of materials and tools. A thru material drawer in rear compartment and a thru compartment at front is particularly useful in addition to other specialized cabinet arrangements.
- "Custom" construction features include four sturdy cross members beneath the steel treadplate floor for greater base stability . . . a deep drop gate at the rear, especially designed to prevent sagging . . . easy-action telescoping roof . . . and double panel compartment doors incorporating galvannealed non-corrosive steel.
- Invest in the model YMR-76 service body. It's new—modern—proven—efficient. It will provide trouble free service over a long period of years for you!

Get the complete story on the York-Hoover YMR-76 Service Body. Write for Bulletin No. 942 Today!

BODY DIVISION
YORK-HOOVER CORPORATION
YORK, PENNSYLVANIA

Creative Engineering for the Public Utility Industry Since 1892

COURTS AND COMMISSIONS

Ohio Commission Hears Security and Rate Pleas

The Ohio Public Utilities Commission recently heard or scheduled the following security issue and rate case applications:

On Nov. 14, the commission granted authority to The Benton Ridge Mutual Telephone Co. to change its name to The Benton Ridge Telephone Co. and issue 2,380 shares of common capital stock with a stated value of $10 per share, aggregating a total of $23,800. Further, the company was authorized to issue its mortgage note in the aggregate principal amount of $40,000 upon the terms and conditions set forth in a loan agreement, said note to bear interest at the rate of 5½ per cent and to be retired in 240 equal monthly installments.

•

The Vanlue Mutual Telephone Co. on Nov. 18 was authorized to issue its three-year note to Automatic Electric Co. for $9,000, the proceeds of which shall be used for the future construction of applicant's plant and property.

•

The Lima Telephone & Telegraph Co. on Dec. 5 was to have had a hearing on its request for a rate increase.

•

The commission on Nov. 14, authorized the Ohio Bell Telephone Co. to:

Establish rates and charges and regulations covering the furnishing of a new type of automatic answering and recording equipment, which is to be designated "Combined Disc and Wire Type."

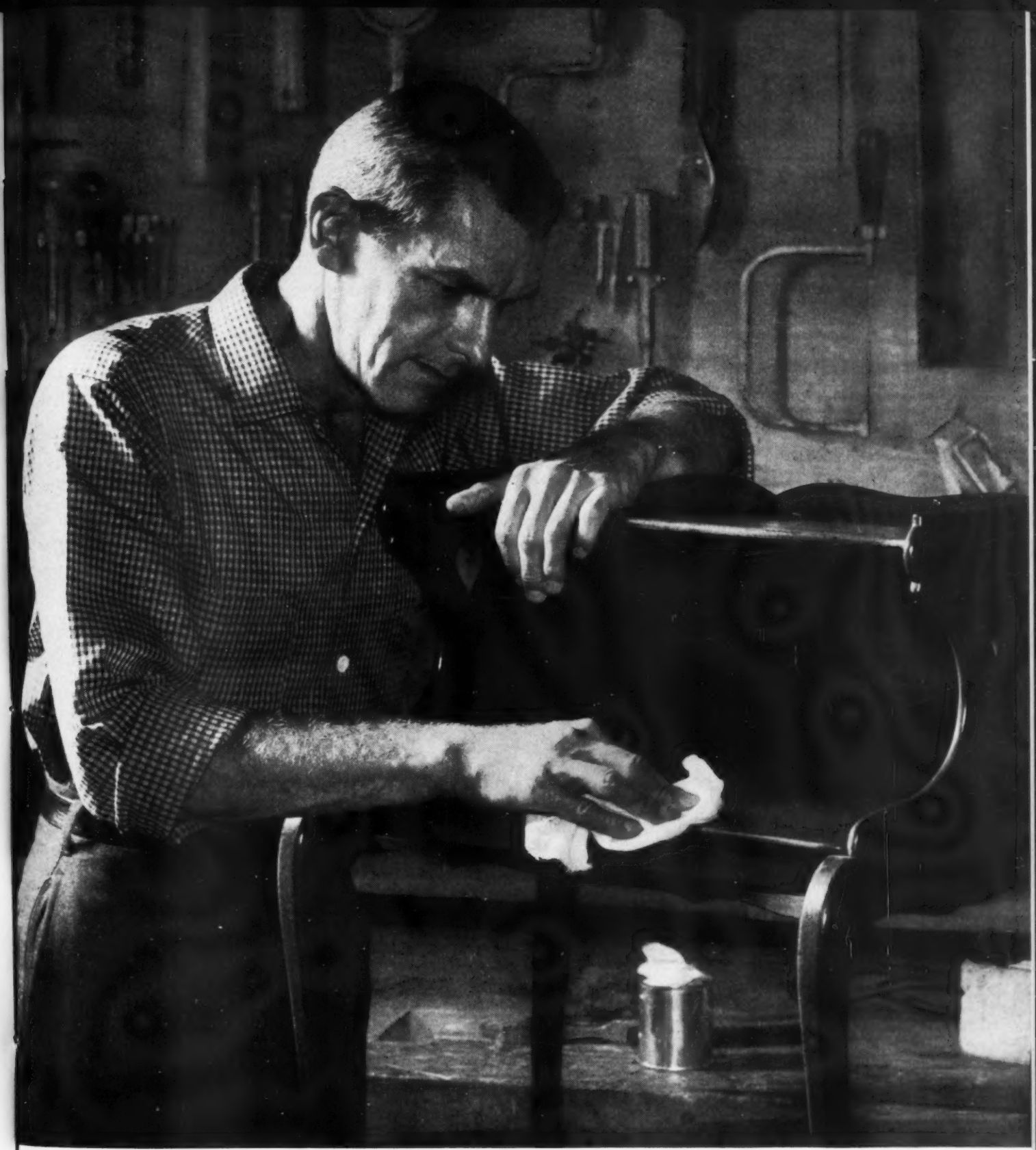
Establish regulations clearly setting forth the circumstances and conditions under which automatic answering and recording services are furnished.

Establish a charge for a change of equipment in the subscriber's existing automatic answering and recording equipment when such change is required to provide an additional feature requested by the subscribers.

Make certain minor rearrangements of text for the purpose of clarification, without change in intent.

Indiana Sale Approved

Purchase of the Wabash Prairie Telephone Corp.'s Waynetown exchange by Indiana Bell Telephone Co. was authorized on Nov. 22 by the Indiana Public Service Commission.



TIME IS THE MEASURE OF ALL WOOD PRESERVATION

On the job–as on your own time–you know the importance of wood preservation. . . . The more the statistics accumulate, the more clearly the answer is AMCRECO pressure treatment.

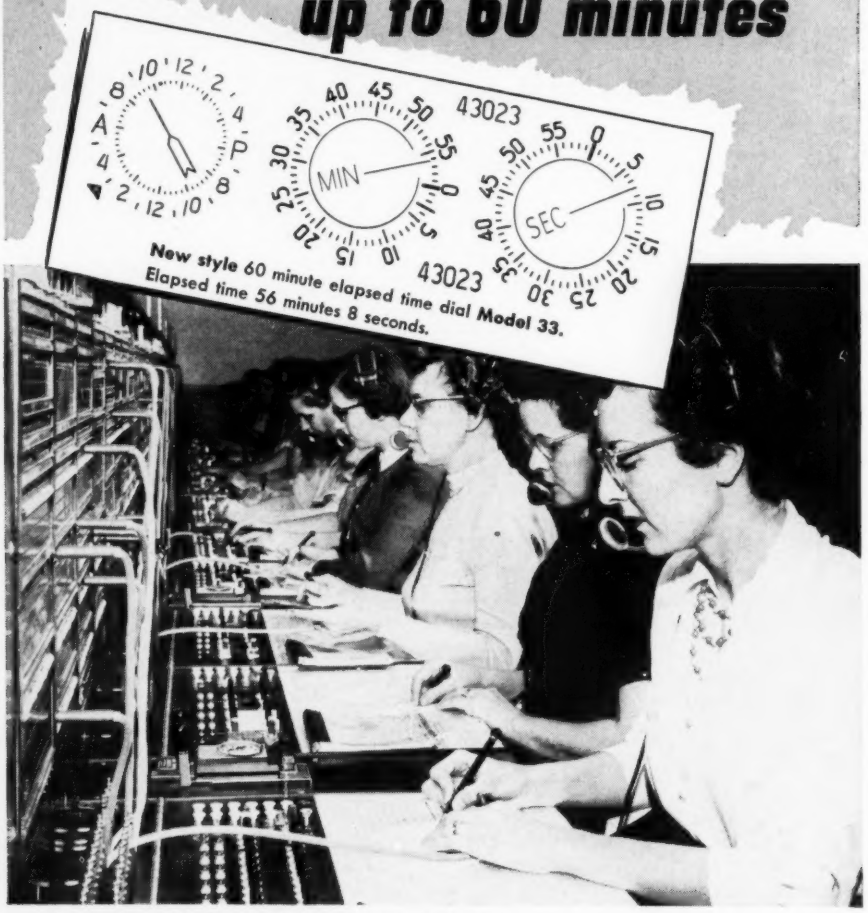
AMCRECO
PRESSURE TREATED WOOD PRODUCTS

AMERICAN CREOSOTING CORPORATION LOUISVILLE 2, KENTUCKY
SUBSIDIARY OF UNION BAG-CAMP PAPER CORPORATION

XUM

CALCULAGRAPH

Now Automatically gives you accurate Toll Call Records— up to 60 minutes



New style 60 minute elapsed time dial Model 33. Elapsed time 56 minutes 8 seconds.

Photo courtesy of the General Telephone Company of Michigan

Now, Calculagraph, the modern dependable computer, automatically figures and prints toll calls up to 60 minutes —no need to add 30 minutes on long conversations.

Thus, Calculagraph adds one more feature to reduce human errors by busy operators and increases the volume of calls handled per operator. Assures you of all revenue due on every call.

For accurate toll call records, for automatic computation of elapsed time, for more efficient operation, install the new 60-minute elapsed time Calculagraph on your switchboard.

Information on this new Calculagraph is yours upon request.

Write today for illustrated brochure to Dept. T.

535

CALCULAGRAPH Company

HARRISON, N. J.

DEPENDABLE ELAPSED TIME COMPUTERS SINCE 1892

Virginia Submarine Cable Damage Suit Settled

A suit filed over damaging of a submarine telephone cable across Hampton Roads has been settled out of court in Norfolk, Va., for $20,000, it was reported recently.

The Chesapeake and Potomac Telephone Co. of Virginia had asked for $33,000 in a suit it brought in U. S. District Court against two firms which worked on the recently-opened Hampton Roads bridge-tunnel.

The C&P company charged that a negligently dropped anchor damaged its underwater cable between Willoughby Spit and Old Point Comfort.

Defendants were Great Lakes Dredge & Dock Co. of New Jersey and Atlantic, Gulf & Pacific Co. of West Virginia. Both companies were engaged in dredging operations in connection with construction of the bridge-tunnel.

The parties agreed to the settlement out of court. Judge Walter E. Hoffman signed an order dismissing the suit.

New England T&T Allowed 6.2% Return in N. H.

A rate increase totaling $1,075,206 was authorized on Nov. 22 for the New England Telephone & Telegraph Co. by the New Hampshire Public Utilities Commission.

The company had applied for additional revenues of $1,480,000 on April 12 (TELEPHONY, April 27, p. 72).

A rate of return approaching 6.2 per cent was allowed New England T&T on its average net investment of $32,681,001.

Hawaiian Company Plans $5,000,000 Bond Issue

Hawaiian Telephone Co. stockholders have authorized directors to issue and sell a 5-million-dollar first mortgage bond issue at 5½ per cent interest, it was reported on Nov. 26.

The issue will be due Oct. 15, 1987 and will be sold privately through Kidder, Peabody & Co. to insurance companies.

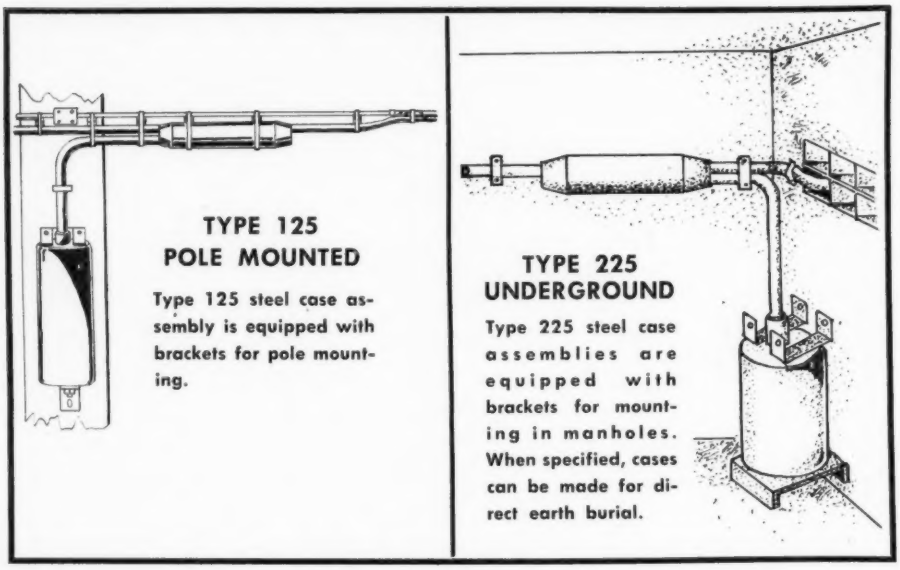
Proceeds will be used to repay bank loans incurred by the company's 1967 construction program and provide working capital for next year.

Authorize Oregon Sale

Application by Frank E. Christensen to sell and Charles J. Augustine to buy Hood Land Telephone Co. was approved on Nov. 26 by the Oregon Public Utilities Commissioner. The Hood Land company serves 203 subscribers near Zigzag.

The Most Widely-Used Telephone Dry Cell In The World
CENTER TERMINAL IS POSITIVE
EVEREADY
TRADE MARK
COLUMBIA
TRADE-MARKS
GRAY LABEL
LONG LIFE
TELEPHONE CELL
This dry cell is the original telephone cell greatly improved and is built especially for telephone use. It delivers long service life with uniformity and dependability in the highest degree.
A
NATIONAL CARBON
PRODUCT
MADE IN U.S.A
The terms "Eveready", "Columbia", "Gray Label", and "Union Carbide" are registered trade-marks of Union Carbide Corporation
NATIONAL CARBON COMPANY
Division of Union Carbide Corporation
30 East 42nd Street, New York 17, N.Y.
UNION CARBIDE

CEECO LOADING COILS



TYPE 125
POLE MOUNTED

Type 125 steel case assembly is equipped with brackets for pole mounting.

TYPE 225
UNDERGROUND

Type 225 steel case assemblies are equipped with brackets for mounting in manholes. When specified, cases can be made for direct earth burial.

The cable stubs may be either lead or plastic, in standard eight foot lengths. Special assemblies may be constructed to meet other requirements. Longer stub length can be furnished when specified on order.

Voice frequency coils, Type 632(88MH) and 638(44MH) are primarily designed for use on two wire telephone circuits. Type MF10, MF11, 641 and 642 coils can be furnished for inter office and toll cables.

CEECO assemblies give "Life like" voice transmission and reception to your long cable and rural distribution wire circuits. "Life like" telephone transmission is a clear, easily understandable telephone conversation over the necessary frequencies present in the voice to be heard via the telephone in the same volume as in "face to face" conversation. Telephone companies providing such quality service will increase subscribers desire to use "LONG DISTANCE" more often, thus increasing revenue.

Write us for assistance on your loading problems. CEECO loading coils are sold by your telephone equipment supplier.

COMMUNICATION EQUIPMENT & ENGINEERING COMPANY
5646 West Race Avenue • Chicago 44, Illinois
Phone EStebrook 8-3109

DESIGN OF CARRIER

Continued from page 24

cies. Over-the-horizon communications are claiming more and more attention and new systems are under active development.

Signaling

One problem which presented itself in connection with channelizing circuitry design was that of signaling. Out-of-band signaling adaptable for both dial and ringdown, was introduced some time ago. The major considerations in signaling design are interference from line noise and static, and reliability of performance under electrical storm conditions.

Two modes of signaling operation are used, namely: On-off and frequency-shift methods. The frequency-shift system is probably superior in performance under high noise conditions, but requires greater bandwidth for operation. It also requires one signaling oscillator per channel; the frequency of this oscillator being shifted between two values.

The on-off arrangement has the advantage of using only one signaling oscillator to feed all channels. This system, as well as the frequency-shift method, is particularly susceptible to impulse-noise type of interference, and it could be argued that reducing the bandwidth in the on-off method could result in performance comparable to that of the frequency-shift.

Which of the two types of systems to use is again one problem that cannot be settled easily. Both have advantages and are reliable. System application and cost considerations normally will decide the final answer in each case.

Slope and Level Correction

Another problem in the operation of carrier systems over long sections of open wire facilities, exposed to radical climatic changes has always been that of compensating for the variations in line attenuations. It is well known that higher frequencies suffer higher attenuations under wet weather or sleet conditions. A "slope" in the amplitude response across the frequency band is, therefore, accumulated along the open wire line, and has to be eliminated at the receiver.

Several approaches are used for slope and level correction. Old type motor-driven regulators have been replaced by automatic or dynamic regulators in modern systems. Frequency inversion, or so-called "frogging," can be introduced at the repeaters, whereby a channel operating at the highest line

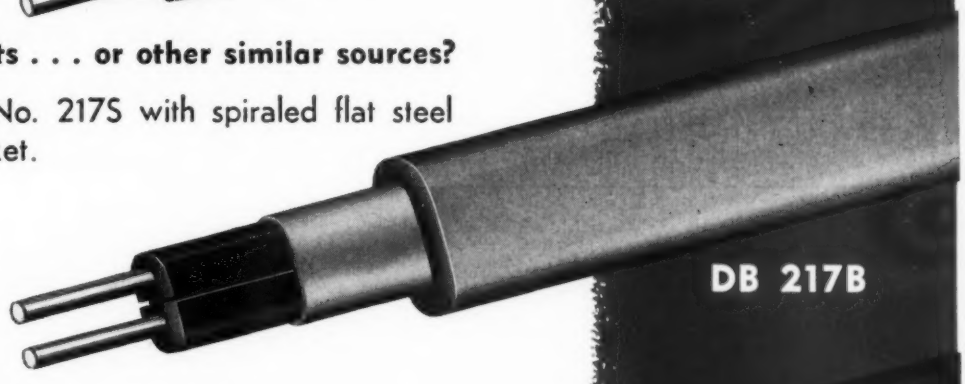
OF THESE 3 TYPES OF
SUPERIOR
DIRECT BURIAL WIRE
...one will "do the trick" for you!

Buy SUPERIOR DIRECT BURIAL WIRE to match the requirements of your installation!

DB 217S

1 Need wire having maximum resistance to damage from road or farm machinery and implements . . . or other similar sources?

Order the SUPERIOR DB No. 217S with spiraled flat steel strip shield and green jacket.



DB 217B

2 Need wire to resist damage from insects and rodents . . . or peculiar soil conditions which are conducive to increased lightning activity?

Order SUPERIOR DB No. 217B with longitudinal bronze shield and yellow jacket.

DB 217

3 Need wire for direct burial installations in areas where conditions are normal and no specific hazards are likely?

Order SUPERIOR DB No. 217 non-armored type with red jacket.

All three types provide excellent electrical and physical characteristics. High tensile strength 17 gauge copper conductors are insulated with polyethylene. Tracer ridge on the core runs the length of the wire. The high grade polyvinyl chloride jacket offers great resistance to water, oils, alkalis and earth acids. Also supplied in 16 gauge copper conductors on request.

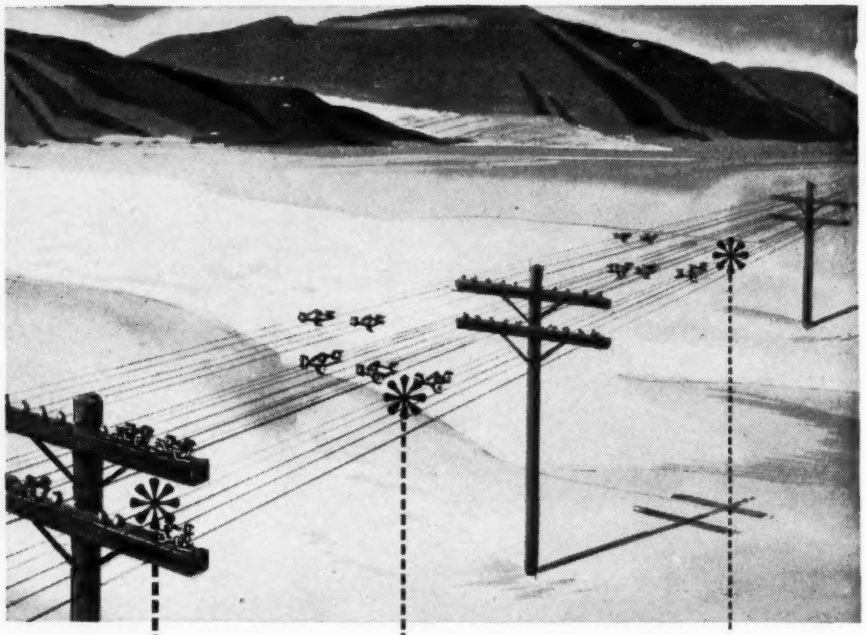
INDEPENDENT

Order SUPERIOR Direct Burial Wire NOW or write for complete i

SUPERIOR CA

SUPERIOR CABLE CORPORATION • Hickory, North Carolin

XUM



CASE after CASE after CASE

Case®

TRANSPOSITION BRACKETS

proved best...world wide

Transposing wires to help expand toll circuits, carrier systems, balance out cross-talk and reduce noise levels has proven itself, installation after installation, throughout the world. Case aluminum Transposition Brackets for cross-arm and span-point transpositions have proved to be the outstanding choice.

• **NEW, IMPROVED DESIGN** . . . the cross-arm mounting slot **now extended** to fit **all standard 12" and 8" pin spacings.**

• **UNIQUE SPAN-POINT DESIGN** . . . the **only** bracket designed especially for mid-span transpositions . . . eliminates special transposition poles.

• **LIGHTWEIGHT** . . . non-corrosive aluminum cross-arm bracket—4 lbs.*; span-point bracket—3½ lbs.*
*(including insulators and bushings)

• **ROLLER SYSTEM** . . . insulators roll, eliminating wire dragging, bracket distortion and protecting wire insulation in stringing.

• **SPECIAL RUBBER BUSHINGS** . . . assures continued communication service in the event of glass insulator breakage.

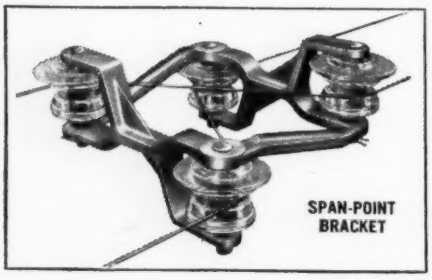
SOLD BY LEADING DISTRIBUTORS IN THE U. S.

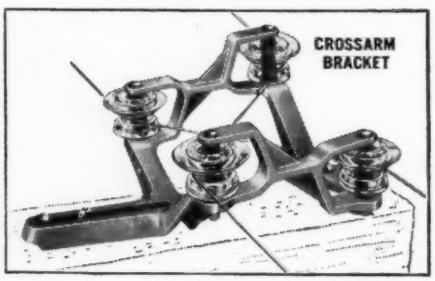
CASE BRACKETS . . . STRONG, LONG-LASTING, ECONOMICAL, ESPECIALLY ADAPTED FOR CARRIER-CIRCUIT CONSTRUCTION

Write today for free illustrated brochure.

TRANSANDEAN ASSOCIATES, INC.

305 MAIN STREET, ORANGE, NEW JERSEY





frequencies is shifted to the lowest frequencies after inversion. The slopes will then tend to cancel for an odd number of repeaters. In effect, if such cancellation is complete, the worst slope with an even number of repeaters in the line, will be equivalent to that of one line section only, no matter how many repeaters are used.

Another method in use is that of transmitting two pilot frequencies at the edges of the frequency band. One pilot is used for flat loss correction and this operation takes place first. The level of the second pilot then provides a relative indication of the slope between the two pilot frequencies, and is used to actuate a variable slope correcting network. Good correction of both slope and flat attenuation is obtained in this way.

Under some conditions, the use of dynamic regulation, especially in repeaters, may result in system instability. When failure occurs on the line, the pilots are effectively removed and regulator gains go to maximum. After the trouble is cleared and the pilots reinserted, the "gains" around the repeaters are abnormally high and 'singing" may result, unless proper precautions are taken in the design of directional and band filters for the repeater.

Frequency Stability

At this point, it would not be amiss to note the problem of frequency stability in carrier systems. The requirements of frequency-shift telegraph operation over telephone facilities and various other considerations, impose a stability requirement of about ±2 cycles for the complete system. If one considers, for example, an 80-mile cable installation with frogging repeaters every 8 miles; it becomes evident that as many as 15 modulation steps can occur between the voice drops of the equipment. Since oscillators at the repeater change frequency independently of each other, a serious frequency error may be accumulated along the line.

The standard methods of transmitting the carrier to the far terminal for demodulation purposes are still in use when a large number of repeaters is employed, but other approaches have also been tried. One of them consists in deriving all frequencies at one terminal from a single source by multiplying and dividing the source frequency. This method gives a complete synchronization of all frequencies generated at each end. A high degree of stability can be obtained if the source oscillators are controlled by crystals placed in thermostatically controlled ovens. The use of such oven controlled crystal oscillators at the re-

In Marshfield, Vermont

"We use polyethylene cable exclusively"

"We use a lot of rural distribution cable, principally six-pair and some C rural wire," says Gardner Hopwood, general manager of Molly's Falls Telephone Co., "Every one of our people prefers plastic cable."

"Polyethylene-insulated cable can be strung with a lot fewer cable rollers because it does not require so much support. It is so light, it makes the whole job of installation easier. It is easy to put up and there is less work and cost involved in setting poles, since extremely long spans can be made."

BAKELITE Brand Polyethylene has demonstrated its efficiency and economy under a variety of terrain and climatic conditions. Its performance in the field has borne out the results of extensive testing in the laboratory.

BAKELITE Polyethylene meets REA requirements for plastic-covered telephone wire, ASA standards for weatherproof wire, and ASTM D-1238-52T for dielectric materials, as well as IMSA specifications for fire alarm and signal control cables.

Learn more about it through Bakelite Company technical publications, available without cost. Write Dept. BC-180.

BAKELITE
BRAND
PLASTICS

UNION CARBIDE

BAKELITE COMPANY, *Division of Union Carbide Corporation,* 30 East 42nd Street, New York 17, N.Y.

The terms BAKELITE and UNION CARBIDE are registered trade-marks of UCC.

XUM

ELECTRIC PLANT
NEWS

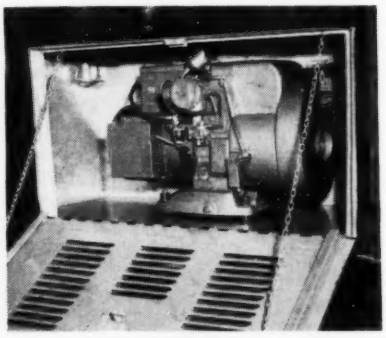
Truck-mounted electric plant cuts costs two ways

Onan Plant provides A.C. power for electric tools and lights, and D.C. output to charge batteries for radio communication.

Utilities using this dual-purpose Onan Electric Plant on trucks report savings ranging from *$2.00 per day* per truck to *$800.00 per year* per truck . . . for the battery-charging feature alone. Before installation of the Onan plant it was necessary to keep the large truck engine running to charge batteries, extremely wasteful from the viewpoint of fuel and engine maintenance.

The Onan plant shown is a Model O7AK, developing 750 watts of A.C. with about 8 amperes for 12-volt battery charging. It is powered by an Onan single-cylinder, air-cooled gasoline engine direct-connected to an Onan all-climate generator in a compact, rigid, long-life unit. A.C. output is sufficient for operation of drills, saws and other tools used for construction and maintenance.

Other vehicular battery charging plants and A.C. models available.



Vacu-Flo cooling system permits enclosed installation

With Onan's Vacu-Flo system, air is drawn (rather than blown) through generator and engine, and discharged through a duct to the outside. An Onan air-cooled plant with Vacu-Flo can be installed in a small compartment within truck or trailer.

Ask your Onan distributor about this dual-purpose unit or write for circular on three battery charging methods.

D. W. ONAN & SONS INC.

4071 University Ave. S. E., Minneapolis 14, Minnesota

ELECTRIC PLANTS • AIR-COOLED ENGINES • GENERATORS • KAB KOOLER

peater, also provides a method of reducing frequency variations to negligible values.

A novel approach to the problem of the frequency error correction in carrier systems has recently been described by the author. This scheme provides automatic correction in both directions of transmission thus eliminating the problem of stabilization of repeater oscillators.

Transistors

The introduction of transistors caused a complete change in the thinking of carrier equipment design engineers. Here was an element ideally suited to meet the requirements of less space, less power drain and more reliability. The vacuum tube, although tremendously improved, was always considered an unreliable circuit element; and transistors seemed to be the ideal substitute. At this point, it must be remembered that successful application of transistors in computer work, radio or television does not necessarily prove that they will be successful in carrier telephone equipment. The requirements of high grade telephone systems are substantially different from those in other fields of electronics, and impose disparate needs on the performance of transistors.

A great deal of work has been done on the exploration of possible transistor use on carrier equipment. Electrically, the primary limitation is the noise and interference requirement of telephone systems. A normal 65 db specification on intelligible crosstalk and intermodulation distortion is difficult to meet with present-day transistors when high power outputs are required at high frequencies, unless expensive and complicated circuitry is used. It is quite common in telephone practice to transmit several steady tones at high levels, and this only aggravates the problem. At all times, cost must be kept in mind, and the use of silicon units which generally show superior performance at higher power levels, is affected by this consideration.

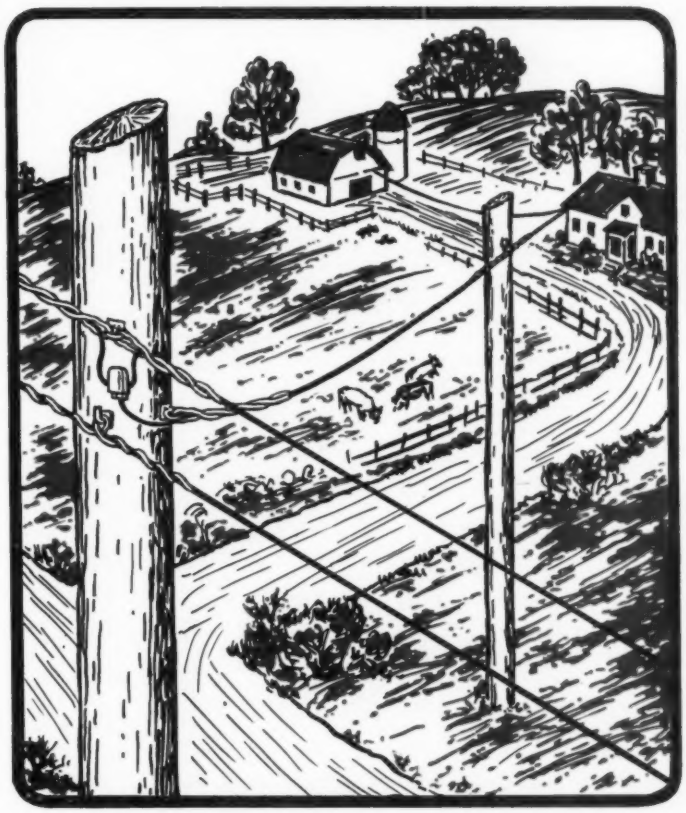
Construction of carrier oscillators, using crystals and transistors, presented relatively fewer problems and good operation was obtained, in most cases. The possibilities of achieving level regulation by means of variation of transistor parameters have also been investigated, but, again, distortion presented a serious problem. Also, frequency characteristics of easily obtainable transistors have so far restricted their usefulness in the design of higher frequency systems.

Despite all these difficulties, active work proceeds on the application of transistors in telephone equipment, and

PWC®

RUR A LINE
TRADE MARK

Polyethylene Insulated Line Wire



A DEPENDABLE INSTALLATION . . .

providing rural extension service at an economical cost. PWC Rur-A-Line is easily installed like a single wire. Maintenance is less than that of open line wire.

Rur-A-Line is moisture and corrosion resistant. It offers excellent protection features with long service life.

PWC Rur-A-Line installations offer the following advantages:

- Excellent transmission characteristics
- Less noise than open line wire
- Long, dependable service life
- Minimum maintenance cost
- Can be installed in parallel with existing cables or open wire

Rur-A-Line #214

is designed for normal span installations. Two #14 solid extra high strength copperweld conductors, 30% conductivity, are insulated in parallel. The special polyethylene insulation has excellent weathering characteristics. Colored Black.

OD=.145"x.280" 34 lbs./1000 Ft.

Rur-A-Line #212

is designed for long span installations. Two #12 solid extra high strength copperweld conductors, 30% conductivity, are insulated in parallel with the same high molecular wt. Polyethylene insulation as used on #214.

OD=.160"x.315" 51 lbs./1000 Ft.

WRITE FOR PWC PRODUCT BULLETIN #105

PLASTIC WIRE & CABLE CORPORATION

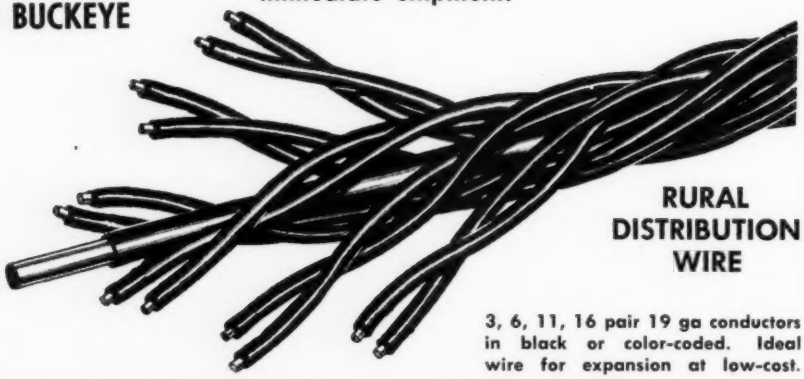
JEWETT CITY, CONN.

XUM

GOOD CONSTRUCTION NEEDS QUALITY MATERIALS

FROM BUCKEYE

The right materials at the time you need them . . . Buckeye maintains large stocks of all materials to provide you with fast, efficient service on all orders. Let us know your requirements, we possibly have it in stock for immediate shipment.

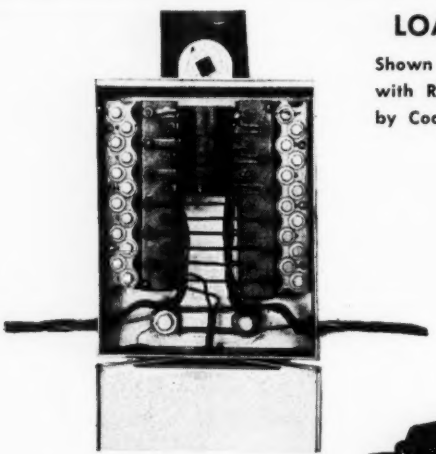


RURAL DISTRIBUTION WIRE

3, 6, 11, 16 pair 19 ga conductors in black or color-coded. Ideal wire for expansion at low-cost.

DIRECT BURIAL WIRES AND CABLES TO YOUR REQUIREMENTS

New developments in Direct Burial Wires and Cables make consideration of buried plant desirable in many instances. Buckeye can fill your orders quickly with the materials to do the job properly and economically.

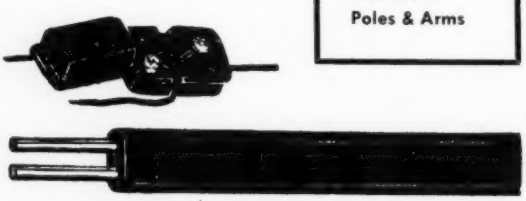


LOADING CASES and TERMINALS

Shown is 177 Type Loading Case by CEECO for use with RDW. We also carry a wide stock of terminals by Cook and Reliable.

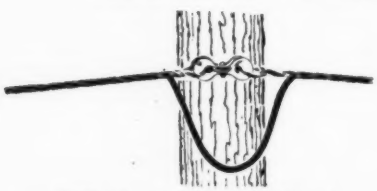
Copperweld Line Wire
Copper Line Wire
Steel Line Wire
Drop Wire
Strand

Cable Supplies
Equipment
Hardware
Tools
Insulators
Poles & Arms



"C" RURAL PARALLEL LINE WIRE & TERMINAL

Two No. 14 or two No. 12 Copperweld conductors or two .083" galvanized steel conductors in Polyethylene insulation. Replaces open wire construction at less cost. Drop wire terminal by Superior for making drops from "C" Rural Parallel Line Wires.



PREFORMED PRODUCTS

Deadends, grips and supports for all wires and strands. Preformed for fast installation.

Whatever Your Needs . . . It Pays to Call BUTELCO!

BUCKEYE TELEPHONE & SUPPLY CO.

1250 Kinnear Road HUdson 8-0655 Columbus 21, Ohio

it is only a matter of time before all transistorized telephone terminals will make their appearance in telephone offices.

Miniaturization and Automation

Even before the advent of transistors, the requirements for smaller, more compact systems, directed the mechanical design of carrier equipment toward miniaturization. Many problems were encountered, but parallel developments in the reduction of component physical size aided in diminishing the over-all dimensions of equipment appreciably.

One problem encountered was that of heat dissipation in small-size equipment using vacuum tubes. In some cases, blowers were needed to alleviate this condition, but such solution has never been popular. In more recent systems, heat problems have been solved satisfactorily by using fewer tubes and better mechanical construction. The advent of transistors will probably solve this problem permanently.

Miniaturization of components went hand in hand with the emphasis on reliability and long life. All kinds of new components were used. The overall size of filters and transformers was considerably reduced. Copper oxide varistors were displaced by high quality germanium or silicon diodes. The long life of these latter units and numerous applications to which they could be put, made their use in modern carrier systems very popular. Germanium diodes matched in sets of four are now used as modulator and demodulator units. They also prove widely acceptable in variolosser units of compressor and expandor circuits, on-off signalling switching circuits, rectifiers in alarm circuits, etc.

Another new component developed in this miniaturization trend and which is widely used is the tantalytic capacitor. This unit encompasses small size with large capacity and has proven very popular. Also, the use of permalloy cores of "wedding ring" size, and ferrites at higher frequencies resulted in small and compact filter units. Permalloy laminations for transformers have also helped in reducing the size of these units.

Printed wiring techniques are coming into use in carrier systems, and show promise of great simplification in manufacturing techniques. The entire mechanical design tends toward easily replaceable sub-assemblies that can be removed from the circuit in case of failure, and returned to the manufacturer for repair. Such an approach also permits rearrangement of circuitry for other applications, and pro-

FOR MEN WHO BUY EQUIPMENT FOR WHAT IT SAVES

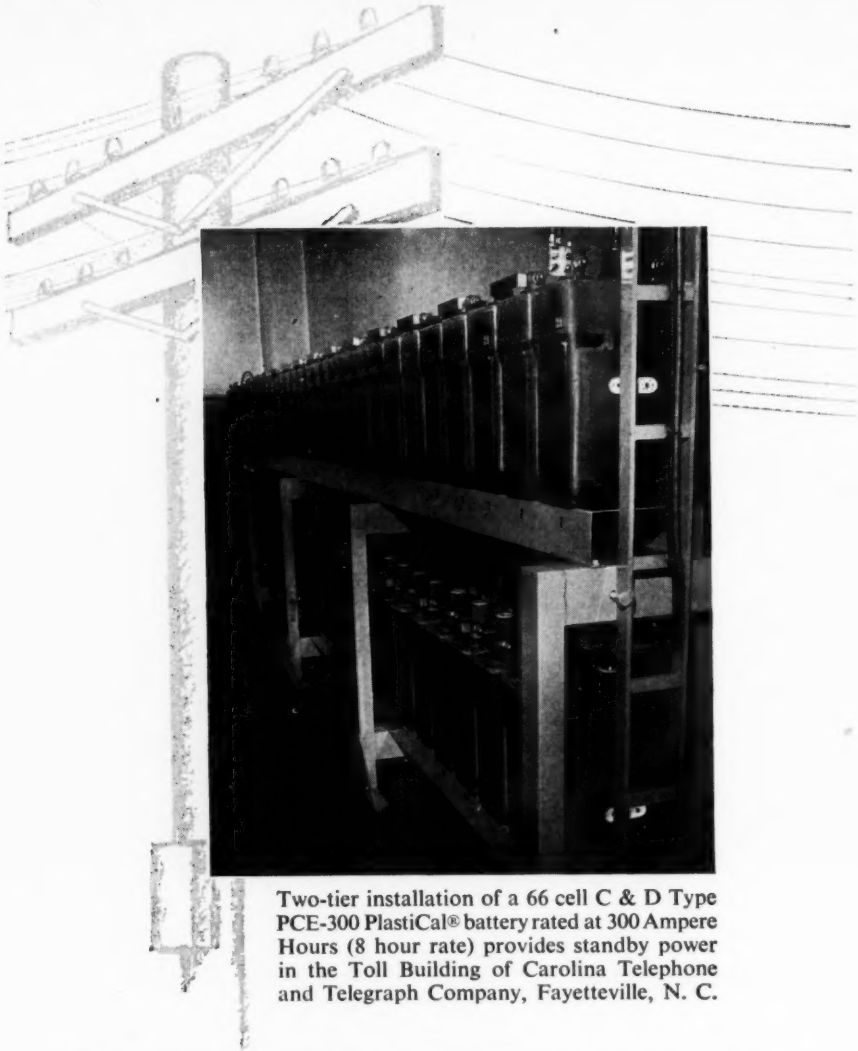
"You have to be practical to stay in business"

Anthony Fago | *Fago Bros. Contracting Co., Inc.*
Tonawanda, New York

Here's a man who speaks from experience. He buys equipment for what it saves in operation. He has plenty of Homelite equipment . . . been buying it for over 10 years. Has Homelite Generators for operating floodlights, drills and power tools . . . Homelite Centrifugal Pumps for fast high-volume pumping . . . Homelite Diaphragm Pumps for water thick with mud and clay . . . Homelite Chain Saws for faster, lower-cost clearing. His reasons . . . maneuverability, dependability and service. Homelite equipment is light enough for one man to carry and put in operation fast . . . even in rough terrain. This saves labor. Homelite's top performance gets the job done faster. This saves time. Homelite service when and where you need it is as close as your telephone. This cuts costs and delays on maintenance. This contractor recommends Homelite equipment to everyone.

HOMELITE
A DIVISION OF TEXTRON INC
1812 RIVERDALE AVE., PORT CHESTER, NEW YORK
MANUFACTURERS OF CARRYABLE PUMPS
GENERATORS · BLOWERS · CHAIN SAWS

XUM



Two-tier installation of a 66 cell C & D Type PCE-300 PlastiCal® battery rated at 300 Ampere Hours (8 hour rate) provides standby power in the Toll Building of Carolina Telephone and Telegraph Company, Fayetteville, N. C.

At Carolina Telephone and Telegraph Company

Toll building batteries are engineered to give 25 years of dependable power!

C & D PlastiCal®, the revolutionary new type of storage battery cells, are built to give extra long life in telephone service.—Installed in February 1954, the battery illustrated is engineered to give 25 years of dependable power.

Advanced design lead-calcium grid construction—rugged, transparent plastic cases—manufacturing know-how developed over many years of intensive effort—rigid quality control—plus a host of exclusive, built-in easier maintenance and safety features—are all in C & D PlastiCal, "*the battery of tomorrow, today*".

For details, send for Bulletin T-530.

C&D BATTERIES, INC.

of Conshohocken, Pa. ... Attica, Ind.

SINCE 1906

SALES AND SERVICE OFFICES IN PRINCIPAL CITIES FROM COAST TO COAST

vides for a very flexible system application. The great quantity of optional arrangements and plug-in units which sometimes results, may be considered as a certain drawback. However, it has no direct bearing on system performance.

Military specifications imposed on carrier systems manufactured for the armed forces, have necessitated a thorough investigation of system operation under extreme climatic conditions. The main difficulty arises when germanium diodes and transistors are exposed to high temperature and humidity for prolonged periods. However, the progress in the manufacturing techniques of these units is so rapid that all difficulties encountered in the application of germanium products at higher temperatures are quickly becoming passive. The development of silicon transistors and diodes is also progressing favorably.

Conclusions

Visualization of the future gives free reign to one's imagination. Introduction of new transistors may bring new circuitry improvements. Printed wiring techniques, combined with super-miniature components, may result in much superior mechanical arrangements than those in existence at the present time. One envisages the day when tiny repeaters will be mounted on the top of telephone poles powered by batteries charged from solar energy converters.

In the field of theoretical studies, it is entirely possible that new methods of more efficient frequency utilization will be found. In the next few years, a tremendous engineering effort will go into new approaches to carrier telephone system design, as an increasing number of manufacturers enter the field. The achievements of human ingenuity are limitless, and there is no reason why telephone systems should be exempted from this category.

Neb. Company Incorporates

Cody (Neb.) Rural Telephone Co. filed non-profit articles of incorporation with the secretary of state, it was reported on Nov. 23. Incorporators are Donald Adamson, Emmet Adamson, Sophia Adamson, Edson Gale, Basil Hollers, Erba McMurtry, H. G. Wallingford, all of Cody; Lyle Wilkins, Orval Wallingford, Glen Wallingford, Elvin Adamson, Joe Adamson, J. H. Kime, all of Nenzel, and Floyd Taylor of Kilgore.

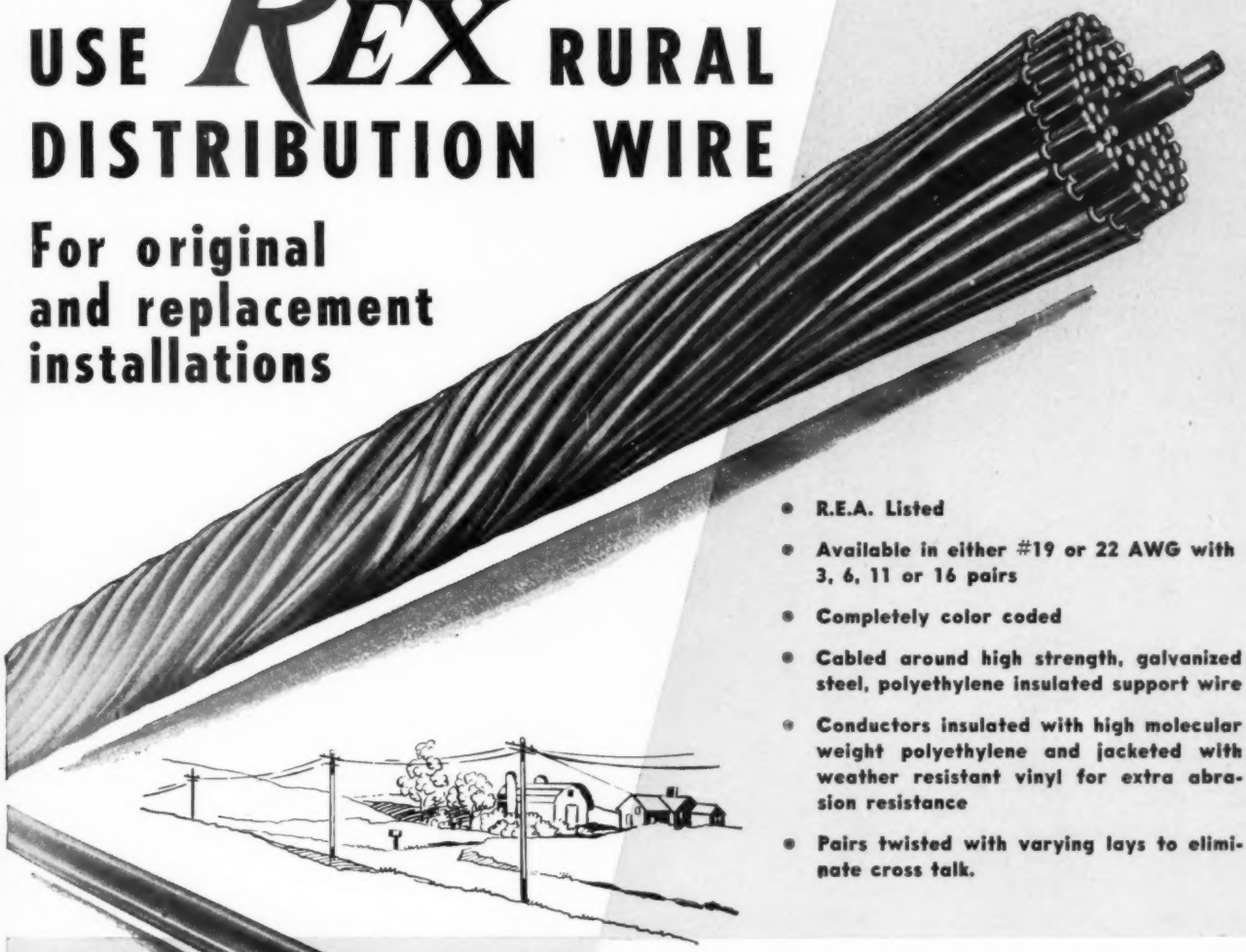
Seeks Rate Raise in Wis.

The Horseshoe Telephone Co. on Dec. 4 was to have had a Wisconsin Public Service Commission hearing on its application to increase rates.

MAXIMUM EFFICIENCY AT MINIMUM INITIAL COST . . .

USE REX RURAL DISTRIBUTION WIRE

For original and replacement installations



- R.E.A. Listed
- Available in either #19 or 22 AWG with 3, 6, 11 or 16 pairs
- Completely color coded
- Cabled around high strength, galvanized steel, polyethylene insulated support wire
- Conductors insulated with high molecular weight polyethylene and jacketed with weather resistant vinyl for extra abrasion resistance
- Pairs twisted with varying lays to eliminate cross talk.

CUT POLE LINE COSTS WITH REX ONE PAIR

(Type C Distribution Wire)

- For span lengths up to 600 ft.
- Parallel conductors are encompassed in high molecular weight, weather resistant polyethylene
- Raised ridge tracer provides polarity identification
- Easily installed
- High electrical characteristics
- Available in #14 or #12 AWG copperweld or .083 steel

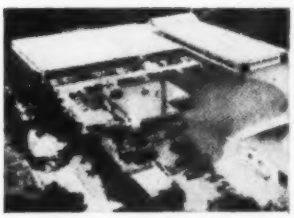
SEND FOR COMPLETE TECHNICAL DATA AND SPECIFICATIONS.

REX WIRE & CABLE

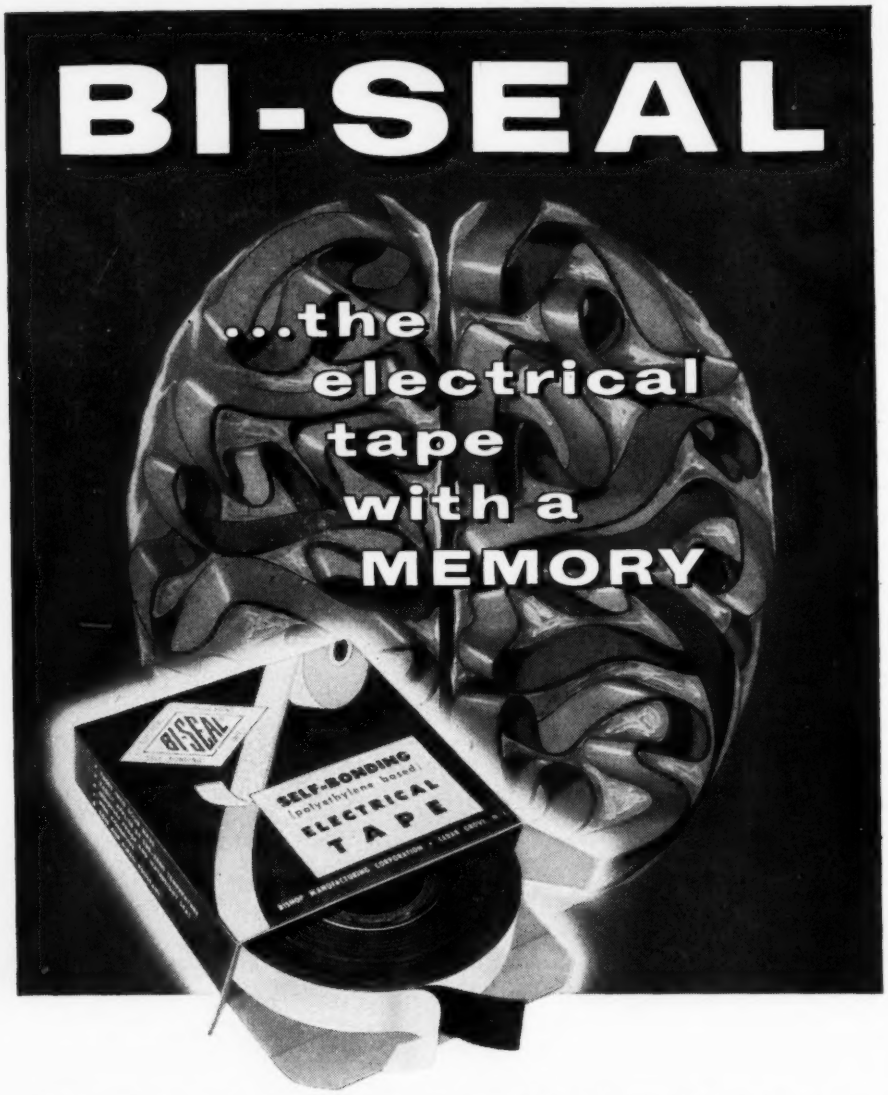
Manufactured by

THE REX CORPORATION

100 HAYWARD ROAD, WEST ACTON, MASS.



XUM



Bishop's Bi-Seal, a self-bonding (polyethylene based) electrical tape, possesses the unique characteristic peculiar to many plastic products . . . a retentive memory. When Bi-Seal is stretched during a normal splicing operation it "remembers" its original shape and fuses into a tight, homogeneous mass in an attempt to return to its normal form.

Within seconds a Bi-Seal splice has become a long-lasting, water tight seal, virtually non-absorbent and offering high dielectric strength and unusual resistance to moisture, corrosive atmospheres and chemicals.

Bi-Seal performs efficiently on any insulation and is unexcelled for cold weather applications, as low as —55°C. . . . never brittle, never shatters, conforms perfectly to the most complex shape or contour . . . lasts as long, or longer than the original insulation.

Highly recommended for communication and power distribution wire and cable splicing, moisture-proofing bi-metal connections, sealing corrosion-resistant conduit couplings, and insulating high frequency electronic circuits. Accepted by REA for insulating plastic telephone cable.

Write today for your free copy of Bishop's new tape catalog.

Bishop Bi-Seal is available from your distributor.

INDEPENDENT

ELECTRICAL INSULATING BI-SEAL SELF BONDING TAPE

BISHOP

MANUFACTURING CORPORATION

12 Canfield Rd., Cedar Grove, New Jersey

INDEPENDENT FINANCING

Continued from page 26

What effect has tight money had on the insurance company with respect to the availability of funds for investment in Independents? They, too, are experiencing a demand for funds far in excess of the available supply. Some are making loans only to those who are currently borrowing from them. In other words, they prefer not to take on new borrowers at this time.

A few other insurance companies are somewhat more flexible in that they have government securities or other investments which they are willing to sell at a loss and reinvest the proceeds at sufficiently high rates today to be profitable. In order to do this, however, they must be assured that the new investment will be in their portfolio at the higher rate long enough to counteract the loss from the sale of the former investment. This has given rise to the prevalent practice of making new debt security issues non-callable for refunding purposes for a specified period, frequently as long as 10 years.

Tight Money Explained

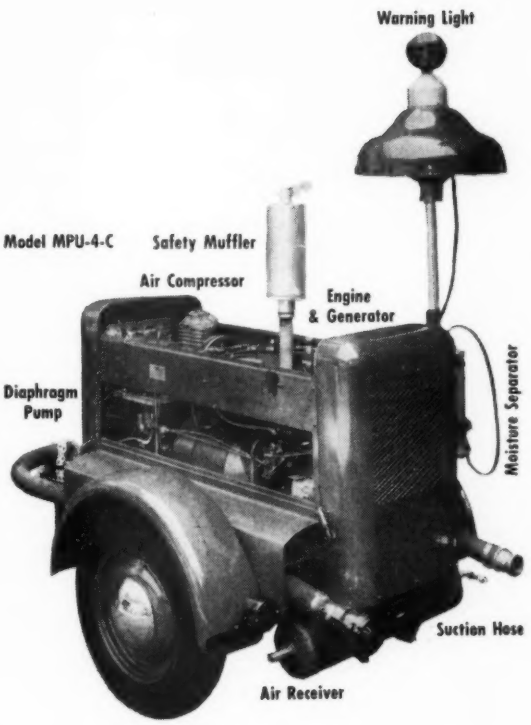
Some of you may have wondered what is meant by tight money and what has brought it about. Basically it is the old law of supply and demand in operation. When the demand for a commodity or service exceeds the supply, the price rises. The same is true of money. Today, the demand for funds exceeds the supply and, hence, money is harder to borrow and commands a higher price in the form of higher interest rates. It is not a case of a decline in the supply of available funds, but one of increased demand, for there is as much or more in the way of loanable funds available and in use today as there ever was.

You might be interested in the following comment made a few months ago by Randolph Burgess, the then under-secretary of the Treasury: "All too many people believe that tight money was simply a result of policies pursued by the Federal Reserve System or by the Treasury. The basic cause of tight money is a great and abundant prosperity and high confidence in the future. This means a demand for money which is in excess of the amount of money the people are saving. That is the real reason why the price of money is high and why it is less readily available."

The Federal Reserve System, by changing its fiscal policies, could expand the money supply—permitting everyone to borrow and expand to their heart's content. The price of this ex-

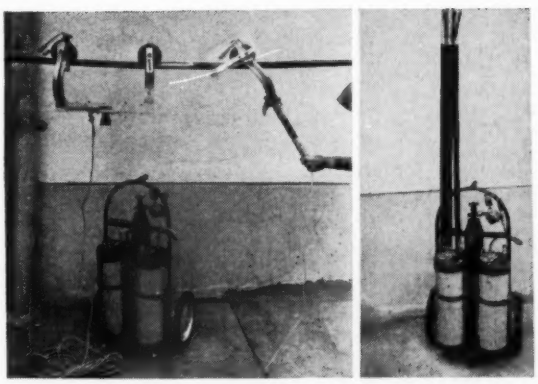
S&G designs for you

and your specific needs



MOBILE POWER UNIT
(Model MPU-4-C)

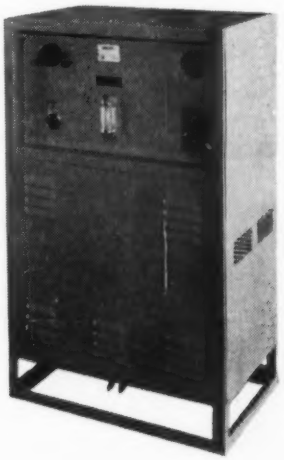
- Generator slow speed for quietness
- Pump—Diaphragm type to remove seepage and drain back
- Air Compressor—to put cables under pressure for cutovers or repairs
- Furnished with or without pump and compressor
- 300-Watt floodlight illuminates working area
- operates soldering pot and iron, electric and air tools
- electric blower to ventilate manhole
- supplies dry air for cable cutovers, flash testing, etc.
- diaphragm pump can be operated from manhole by push button control
- buzzer signal for summoning helper
- light, easy to handle



LEAK DETECTOR APPLICATOR
(Model LD-1 & LD-2)

Both models use highly successful chemical type leak detector. Applicator's dual nozzle sprays both sides of pressurized cable, giving 100% coverage. Bubble cluster forms around leak within minutes and can be clearly seen from the ground. Air pressure bottle in cart supplies regulated pressure in solution tank at all times, can be adjusted for different heights.

MODEL A
Air Compressor Dehydrator



Exchange equipment designed to supply chemically dry air for telephone cables, aerial and underground, this unit can supply as many as 30 cables. The unit is equipped with volume recording air meter, high and low pressure alarm switches, humidstat and hour meter.

- **Completely automatic in operation**
- **Air purifier to eliminate oil mist**
- **Incorporates the latest safety devices**

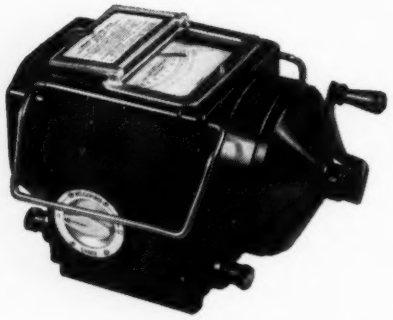
S & G MANUFACTURING CORPORATION
P. O. Box 1309 • New Orleans 10, La. • RAymond 3142

XUM

Telephone Trouble-Shooters Find Failures Faster with Biddle Electrical Testing Instruments

Whether it's maintenance, rehabilitation, or special development work, there's a dependable Biddle instrument practically made-to-order for any electrical testing job you face. It's good to know all about these fine instruments . . .

Have you sent for the latest literature?



MEGGER® INSULATION TESTERS

are the most generally accepted devices in the world for detecting incipient weaknesses in the insulation of nearly all types of electrical equipment.

Pictured here is the Meg type of Megger Insulation Tester—the most popular instrument in our line. Like all Megger Testers it contains its own power supply in the form of a hand generator —no batteries to let you down. This is a 400 v. instrument with a discharge switch.

For complete information write for

BULLETIN 21-45-T

MEGGER® GROUND TESTERS

measure the resistance to earth of ground connections simply, easily and accurately, and thereby help to determine whether such connections will perform the services for which they were designed and installed.

Pictured here is the CVM type of Megger Ground Tester. For complete information on all ranges and types of ground testers write for

BULLETIN 25-T

FRAHM® FREQUENCY METERS

Frequency measurements are made easy with this miniature portable Frahm Resonant Reed Frequency Meter. Vibrating reed tips form a pulsating pattern that makes it easy to read alternating current frequency from 15 to 1500 cycles per second.

Meter is applicable to pulsating or interrupted D-C as well as A-C supply circuits. Sturdy — no delicate pivots, jewels or moving parts. Remains relatively unaffected by external fields and is independent of load, power factor or phase shifts in supply circuit. Available in switchboard, miniature and portable types. Model illustrated is used for checking bell-ringers.

WRITE FOR BULLETIN 32-T

. . . serving your industry since 1895

B-707-R

JAMES G. BIDDLE CO.

Electrical Testing Instruments • Speed Measuring Instruments
Laboratory & Scientific Equipment
1316 ARCH STREET, PHILADELPHIA 7, PA.

pansion would be inflation of the cost of goods and services; whereas the price of not expanding the money supply is an increase in interest rates. Which is the lesser of the two evils? For the utilities with their large projected capital expenditures, the latter would appear to be the preferable policy.

Interest Rates Up

Now, that we have these tight money conditions with us, interest rates on borrowings are up. Bonds of the large utilities issued in the last six months bear interest averaging around 5 per cent. This compares with an average of only about 3.6 per cent for the first part of 1956. The smaller Independents can expect to pay between 5 per cent and 6 per cent for short-term money and probably 5½ per cent or more for long-term. This is the current range for bank loans, as well as loans from insurance companies and suppliers.

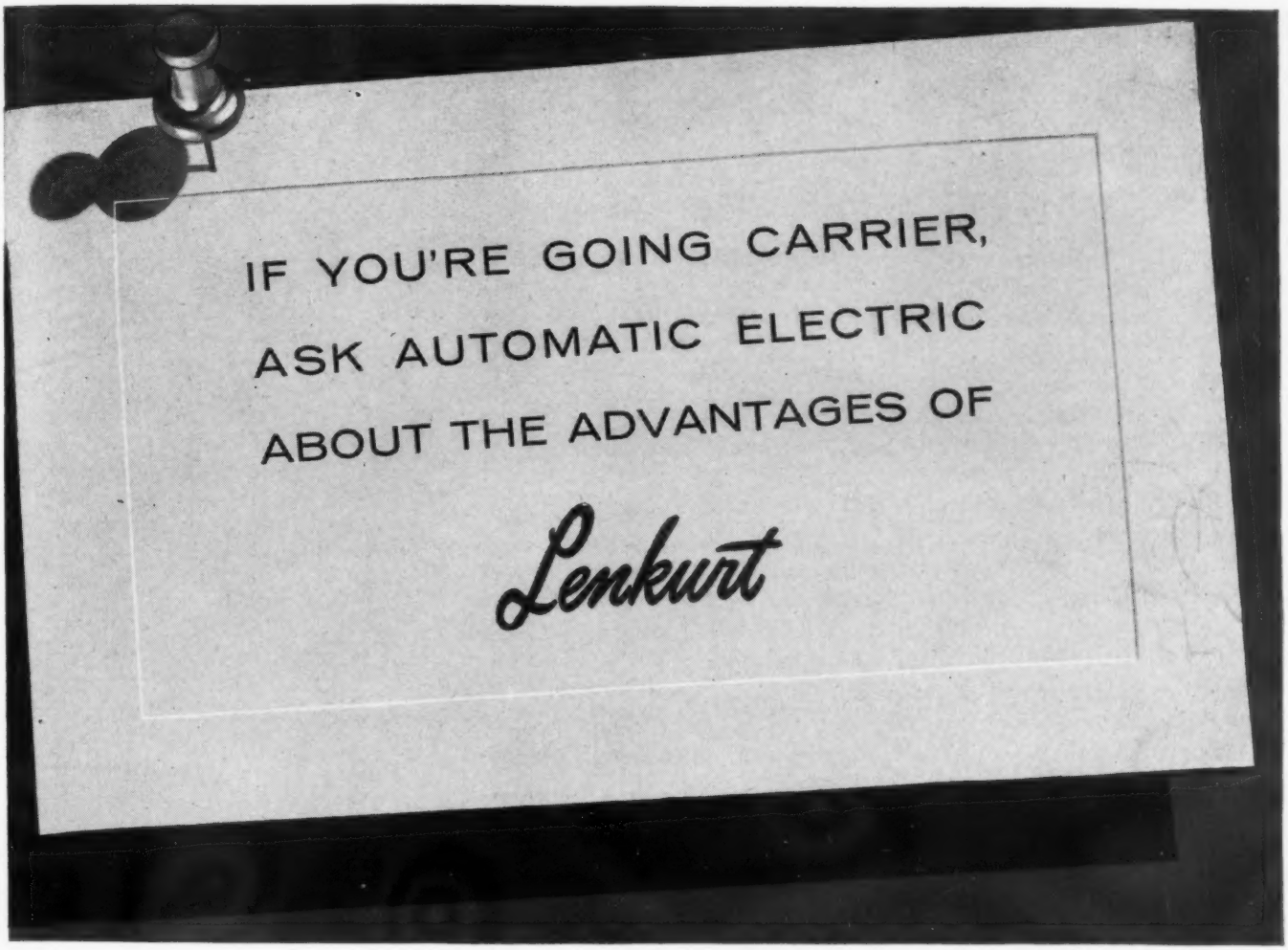
Interest rates of from 5 per cent to 6 per cent are not unusually high. This statement might surprise you, but if you go back and look at rates over a period of say the last half century, you will find that today's interest rates are not at all extraordinary. It has been only during the period since the early or middle 30's that we have had consistent cheap money. To those of us whose business careers date from the 30's, it is hard to accept anything but cheap money as normal, but it by no means has always been the case.

The only lending agency which so far has not given effect to the new look in interest rates is the REA. It continues to charge 2 per cent for 35-year money when it costs the government itself around 4 per cent to borrow such funds. In this way, you and I and the other taxpayers of our country are now subsidizing, more than ever, the owners of REA financed telephone companies. There has been agitation to induce Congress to rectify this discrepancy and it would appear that corrective action is overdue.

So far, I have discussed primarily dept securities and interest rates and the effect of tight money. These generally are the conditions which exist in the larger money centers.

There is another avenue of financing which has been somewhat less affected by tight money conditions. That is the sale of stock to your subscribers, employes and existing shareowners. Management that maintains good public and stockholder relations should be able to successfully sell preferred and common stock in its territory. We are told that the savings of the people of our country continue to rise. There is no reason

(Please turn to page 83)



... BECAUSE Lenkurt Carrier is the simplest, fastest, most economical way to add profitable new circuits, using present wires. Only with Lenkurt Carrier do you benefit from advanced engineering features like these: direct interconnection at carrier frequencies . . . exclusive "building-blocks" concept of interchangeable, plug-in components . . . utmost simplicity of installation, maintenance and expansion.

... BECAUSE Automatic Electric offers you Lenkurt Carrier in one complete package—engineered, furnished and installed. We take complete responsibility until your system is operating smoothly.

... AND BECAUSE Lenkurt Carrier Systems are engineered *by* telephone men *for* telephone company operations.

Automatic Electric Sales Corporation,
Northlake, Illinois, Fillmore 5-7111
In Canada: Automatic Electric Sales (Canada) Ltd.,
Toronto, Ontario. *Offices in principal cities.*

AUTOMATIC ELECTRIC

A member of the General Telephone System –
One of America's great communications systems

GENERAL SYSTEM

XUM

construction and maintenance DIGEST

- **Able cable**
- **25-year battery**
- **Quick and easy**
- **Underground winner**

Published regularly to help you get the most out of your materials and supplies dollar

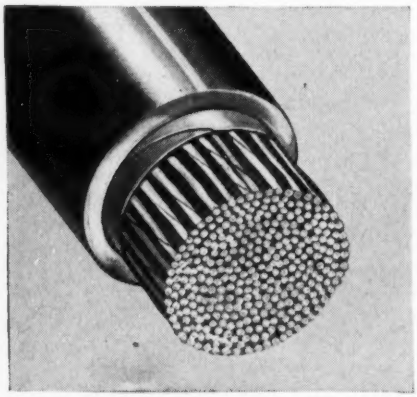
by Ernest P. Riviere, Jr., Inside Sales—San Francisco

The other day I chalked up my 5th year with Stromberg-Carlson—but one of the orders I filled that day made me feel pretty much a youngster in the business: I sent out a battery we promise will serve you for 25 years! That started me thinking about other equipment we supply. Here, the guarantee is a quarter century—there, it's for life, **period.** And always, the guarantee is a double one—ours, and the maker's. It made me realize again how much your orders mean to the science of telephony. It's your supply business that helps us continue our research for ever-better, ever-longer-lived telephone equipment. Thanks a lot!

Uniformity, Dependability, Lasting Service

When you've said that about cable you've covered about everything.

Kennecott Telephone Cable fills the bill in uniformity, dependability, lasting service for our telephone cable customers.



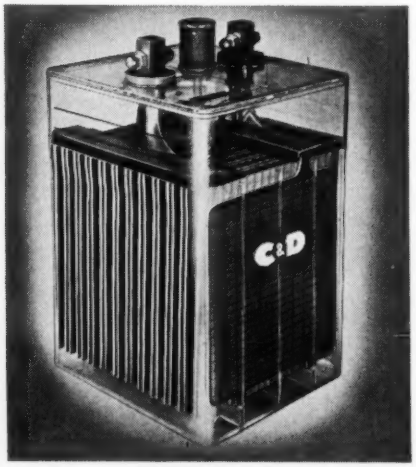
Before a single inch of Kennecott cable leaves the mill, it is tested for Dielectric Strength, Insulation Resistance, Conductor Resistance, Capacitance and Fixed Dimensions. Such care in manufacture is your warranty of efficient, trouble-free performance in the field.

Specify Kennecott — distributed by Stromberg-Carlson.

Battery will still have its pep when 1982 rolls around

It will last 25 years—in full float service! That's the life expectancy of C & D's PlastiCal (lead-calcium grids) telephone battery.

You get this extra-long, trouble-free operation because C & D Batteries, Inc. use an exclusive suspended and supported plate construction.



In full float service, this telephone battery stays on the job a quarter of a century.

Illustrated here is a typical C & D telephone battery with a 660 A.H. capacity. When ordering this 25-year battery, specify PCE-660.

When you find that a 14-year expectancy meets your needs, you can get dependable operation from a C & D PlastiCell (high-tensile lead alloy grids) battery. For a PlastiCell with capacity of 660 A.H., specify CE-23.

You can order either of these C & D telephone batteries, plus other capacities, from your Stromberg-Carlson representative. Ask him about extra-long-life power supply with C & D Batteries.

Time and Money Saver

You'll find Cook PLX Cable Terminal the quickest, easiest and most economical to install because there's no stubbing, no splicing, no potting.

Available in 6, 11, 16 and 26 pairs

It's designed for use on plastic cable. You loop the cable through the terminal without cutting wires and terminate the desired pairs for distribution. You can also use the terminal for junctioning and terminating cable.

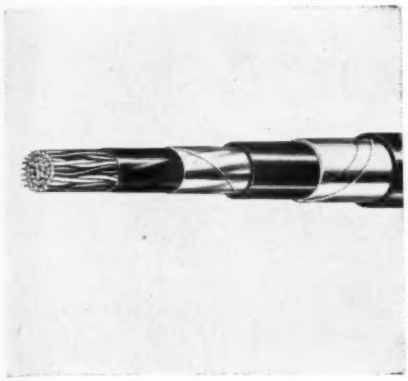
Grommets are furnished to seal the cable entrance. When ordering, specify cable sizes to get the correct grommets.

Heavy galvanized steel frame, deep drawn chamber, welded zinc cover and the famous XB Bakelite face plate with Everdur studs are some of the major features of the Cook Electric Company's PLX Cable Terminal. It can be furnished with or without protection.

Your Stromberg-Carlson representative can offer prompt delivery on your order.

Cable that can take it

This Ansonia Wire & Cable Company product offers finer electrical characteristics than any other comparable cable.



Available in 24, 22 and 19 gauge, 11 through 404 pair

If you want direct burial cable that stands up under severe ground conditions, order Ansonia Type 775-AP Cable.

Its individually insulated conductors are paired and cabled with a covering of aluminum tape, a plasticized jacket, plus a butt-lapped, stagger-jointed, flat armor tape and a second overall jacket of plasticized polyvinyl chloride.

When you need cable that gives maximum protection, specify Ansonia Type 775-AP Cable.

Fast delivery available from your Stromberg-Carlson representative.

Did you know... that the expanded Stromberg-Carlson Telecommunication plant provides 800,000 square feet of floor space devoted exclusively to meeting your equipment and supply needs? These increased facilities enable us to serve you better than ever.

Distributed by

STROMBERG-CARLSON

A DIVISION OF GENERAL DYNAMICS CORPORATION

Sales Offices: Atlanta 6, Chicago 6, Kansas City 8, Rochester 3, San Francisco

why a good share of these savings should not be in the securities of your company.

A well-managed telephone company can offer its public a sound and attractive investment opportunity providing an income as good as or better than most other forms of investment available in the area. You may argue that your family owns the company and does not want to dilute its holdings and possibly lose control by issuing additional common stock. I feel that, within limits, such a company should be able to sell preferred stock locally to provide part of its growth capital. Preferred stocks form a part of the capital of a large majority of the utilities of the country and most every commission will approve their issuance, as long as the amount is not excessive. It is true that dividend rates on preferred stocks are higher today, but not as high as the rate of return most commissions will permit utility companies to earn in order to attract the needed capital.

Study the economy of your area when crop payments are received, when the factory payrolls are the highest, or they pay the most overtime, when the banks pay interest on savings deposits, etc., and time your stock sales campaigns accordingly. Others have successfully sold securities locally. You can, too. If you feel that you might need help, talk to your banker or nearest security dealer.

To review today's financing picture —money is certainly not as easy to borrow as it has been in recent years and what funds are available are definitely more expensive. The picture is not all black, however. Most banks continue to lend the money required by their deposit customers; some insurance companies are still buying Independent telephone company's debt securities; many of your customers have money on which they would like to earn a good return; and the REA is very active in providing expansion and improvement capital, as well as are the equipment suppliers.

DESIGN OF SMALL COMPANIES

Continued from page 38

However, the effectiveness of any protective unit is entirely dependent on the resistance of the path to the earth. In some sections of the country, ground resistance of 3 ohms or less can be secured with 6-foot ground rods, while, in others, rods of 50 feet in length will show readings of many hundred ohms.

Trouble conditions have been reduced by means of attaching the cable to the messenger by the spinning method. This practice has received considerable attention by engineers and has been further advanced by the use of non-corrosive spinning wire. The problem of sheath protection at the messenger hanger, has been solved by the development of plastic spacers which permit the cable to be suspended below the messenger at that point.

Modern practices specify the type of construction which, while not excessively costly, can be replaced with one that uses a length of junked cable sheath which is split and placed over the cable at the hanger location, which will be held firmly in place after the spinning operation is completed.

Considering the low price of load, a small company should consider this method if sufficient junk cable is available. A saving will be realized if the sheath is cut up during "non-productive" hours. A considerable number of cable jobs have been in service for many years with this type of construction without any signs of sheath damage showing up at the pole locations.

The practice is also applicable on lead cable installations where the spinning method is used. It can also be used at the sleeve locations, but is not as satisfactory when compared with lead or plastic spacers, despite the fact that hand lashing wire or cable support straps at each end of the sleeves will add additional labor and material costs.

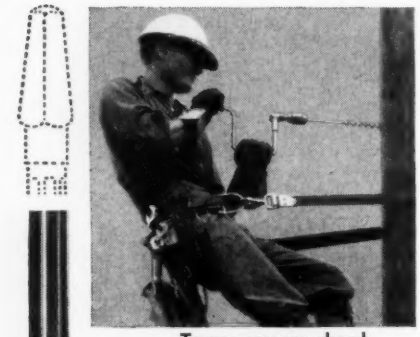
It is not the intent here to imply that cable ring jobs have been eliminated in all present-day cable installations. Local conditions may be such that the ring method for lead cable suspension be used because the engineering study indicates that the procedure is more economical, after all factors, including the cost of the spinning equipment, have been considered.

In the early days of plastic sheathed cable, there were cases where the insulation and sheath construction became brittle at temperatures below the freezing point, thereby permitting the possibility of mechanical damage. This condition has now been eliminated by all manufacturers.

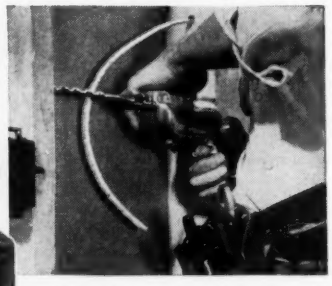
However, any old cable can be tested by placing a short section of it in a freezing compartment of a refrigerator. When the temperature of the cable has been reduced it can be removed from the refrigerator and be struck sharply on a hard object. If there are any cracks in the sheath or conductor insulation they will indicate that the plastic has a tendency to become brittle

New adapter shank bit

fits either hand brace or power drill



Taper square shank fits hand braces



Cut off taper and use "hex" shank in both power drills and hand braces

Cut your wood bit inventory by 50%

Now you can eliminate the need to stock two types of wood auger bits. Irwin's new Adapter Shank Bit fits both hand braces and power drills.

With hand braces, use the Adapter Shank Bit as it comes. Cut off taper square and the Adapter Shank, with its 6 "hex flats", chucks perfectly in power drills or hand braces, either one. No wobble, no run-out. Clean, efficient cutting action. Reduces inventory and record keeping by 50%. Saves time on the job, too. Call your distributor, or write today for complete information. Sizes 4/16" to 17/16", both solid center and single twist types.

***All Irwin Adapter Shank Wood Bits** are forged in one piece from special steel and heat tempered full length for longer life. Plastic coating on balanced cutting heads guarantees factory-fresh sharpness, unequalled performance. Widely used by utilities, electricians and construction workers.*

IRWIN auger bits • screw drivers

Wilmington, Ohio

at lower temperatures and should not be put in plant if the damage is appreciable.

The "B" box was a standard fixture in many of the cable plants years ago and was eliminated in modern plant designs mainly because of excessive maintenance costs. The source of trouble was poor insulation resulting from moisture conditions which could not be readily eliminated.

Mechanical damage was also caused by insects and birds, so the practice was abandoned despite the many advantages of the plan. The use of plastic insulated conductors is advantageous to small companies in which the cable record changes can be made by the same individual who makes the cable pair count change. It permits full use of idle cable pairs without opening and re-opening the junction splice in accordance with varying service demands.

The same result could be accomplished by using one of the mechanical reusable sleeves now on the market, but the operation would be simplified if "B" box jumper wires were worked instead of the cable conductors. Sooner or later difficulty would be encountered, especially if the same conductors were changed a number of times.

At the present time, a completely satisfactory, readily accessible small junction box which will permit the jumpering of cable pairs has not been developed and, no doubt, will not appear until telephone engineers give the need for it due consideration. It appears that the smaller companies are in a better position to recognize the advantages of a cross-connecting unit of this kind and their demands probably will hasten the design of an acceptable unit.

The plan is receiving consideration in some large companies, but is being limited to cable jobs with heavy feeder cables, since, in cases of that kind, the economies of the plan are more evident.

Cable testing and trouble shooting in the one-man exchange are also simplified with a cross connecting box, since it readily permits the sectionalizing of the cable at junction points.

Present-day engineering practice, in a large number of cases, specify full-length treated poles which are available with several different types of treatment, all of which prolong the life of poles far beyond those not chemically treated. Normally, the treatment is applied by the pole supplier in accordance with accepted standards, since full-length inpregnation cannot be done economically by the purchaser.

Anchor construction has been more or less standardized in the past, but guying costs have changed with the introduction of devices to replace the three-bolt clamps. The cost of these devices is higher than that of the clamp method and their use is governed by the saving in installation labor. Therefore, the construction labor rate in effect will determine whether or not the use of these devices on guys, and for cable strand connecting and terminating purposes, is advisable from a total cost standpoint.

The installation of suitable ground rods, which will permit adequate grounding of protective units, is not a problem in locations where the resistance to the earth is low. In many instances, sufficient low resistance grounds can be secured by bounding terminals to the cable strand and using the associated anchors for that purpose. However, in high-resistance locations, sectional rods with suitable connecting joints can be used.

The problem of driving sectional grounds can be simplified by using a gasoline hammer instead of a sledge hammer, or a lead-weighted pipe driving unit. These hammers have sufficient power to make an installation in coarse gravel and other soil which has considerable rock in it. The installation may be deflected off of a perpendicular line, but sufficient depth can be secured to obtain the desired ground reading which is standard for the locality.

In those cases where rock stratum or bed rock is encountered, a series of rods driven to that depth and tied together as a common ground will supply capacity for office and terminal locations. While the ground resistance reading may not come down to accepted standards, it will go a long way in establishing grounding protection, with a resulting reduction in maintenance costs, both on cable and station facilities.

(To Be Continued)

McKAY BOOK REVIEWS

Concluded from page 60

and no mathematics. Although the telephone isn't even mentioned in the theory part of the book, the principles of hearing that are explained can clear up a lot of puzzling aspects about telephone transmission, if you're sharp enough to see the connection.

This book can be purchased from TELEPHONY.—**Reviews by Harold B. McKay, TELEPHONY's Electronics Editor.**

Name Ga. Co-op President

Lynn W. Bonds of Guyton, Ga., has been elected president of the Planters Rural Telephone Cooperative, Inc., Newington, Ga., it was reported recently.

THE HIGH SCHOOL GRADUATE

Continued from page 40

most old sayings, this is only partly true. If a little learning makes a man think that he knows it all, it is indeed a dangerous thing. However, if it makes him realize how little he really knows, it has a sobering effect. If a little learning makes a man eager to follow up some particular study as far as possible, it may be very stimulating.

Mathematics is necessary, both for its own value and because without it science cannot be learned. We cannot go far in any science without encountering a mathematical problem. In electrical work, especially, there are many principles that cannot be understood without a mathematical approach.

Algebra is the basis of all mathematics. The student who is looking forward to telephone work should take all that is offered by his school. Geometry (the study that develops reasoning power) is very useful. Trigonometry is necessary in telephone work, but our high schools offer very little of this.

Our high schools now have excellent courses in manual training or "shop work," something that was non-existant at the time this writer attended high school. To learn to do things with the hands is a "must" in practical education. It does not matter whether the student takes up wood work, metal work, plumbing, electric wiring, or some other shop work, he learns to handle tools. His muscles become coordinated and he learns precision of movement. All of this will be directly useful in the telephone business.

In addition to these directly useful subjects we must remember that a telephone man (unlike many other manual workers) is in daily contact with the customers and the public. He enters the offices and homes of the subscribers and enters into conversations with them. He must be able to talk on general subjects, as well as the telephone business, and to do so without making glaring mistakes in pronunciation or grammar. He must be courteous and well behaved—in other words, a gentleman. The literary courses offered by our high schools help develop this ability. A course that consisted of science and mathematics only, would not be good.

A telephone man must be able to read and understand what he reads. (Many can read without understanding what they have read.) New equipment and new practices which are continually coming up in our business are described in print. Even though the supervisor may be able to discuss some of these orally, it is absolutely necessary that the workman be able to read and understand this printed matter. He must also be able to express himself clearly in writing. He will certainly be called upon to make written reports of many kinds. The study of reading and writing begins very early in the school life, but it should be perfected in the high school.

The most valuable thing that is obtained in any school is *the ability to learn*. The substance of what is taught in school may not be directly applicable to the students life work, or it may soon become obsolete, or even be proved to have been false. Thus, when this writer studied physics and chemistry, one of the cornerstones of these sciences was the law that the atom is the ultimate particle of matter. The atom is indivisible and indestructible. Hence matter cannot be destroyed. Since that time science has found that the atom is very complex. At least three different kinds of particles within the atom have been identified. Electronic science easily separated the electrons from the rest of the atom, then came atomic fission. The core of the atom was split and *destroyed*. Matter was destroyed and the result was energy. (A very enormous amount of energy.) Thus the most fundamental laws of science that we had learned in school had to be relearned. One thing that a telephone company should look for in a new employe is the ability and willingness to learn new things.

"Aptitudes" and "aptitude tests" are terms much used by psychologists. When we say that a person has a natural aptitude for a certain line of work we mean that he can learn that line of work more easily than some other line, will be more successful at it, and will *enjoy* that work. Some psychologists believe that a child is born with certain aptitudes, while others insist that all aptitudes are acquired—perhaps unconsciously. Be that as it may, it seems obvious to this writer that given a group of men in their late teens applying for jobs in the telephone industry, one or more of them will have much greater aptitude for the work than the others. The employing officer of a telephone company should seek means of detecting and proving this aptitude. (We will have more to say on this point in another article.)

In this article we have just touched on some of the highlights of the employment problem and its relation to the American high school. The large

HERE'S SAFETY—SERVICE

you can always depend on. For Klein tools and equipment are designed better for your jobs—made of the finest materials—individually tested and inspected. Look for the familiar Klein trade-mark—serving the electrical industry "since 1857."

ASK YOUR SUPPLIER

Foreign Distributor:

International Standard Electric Corp., New York

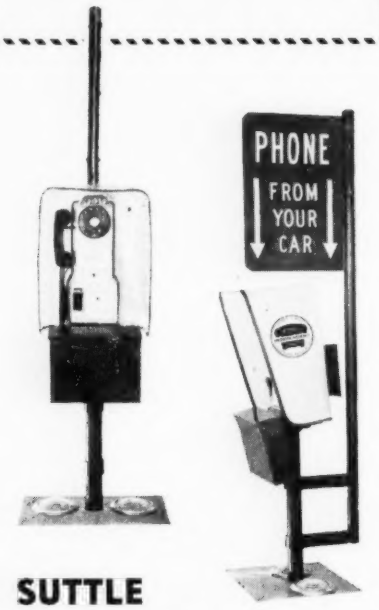
100 years of service to linemen, electricians and industry is back of this new Pocket Tool Guide No. 100. A copy will be sent to you on request, without obligation.

Mathias KLEIN & Sons
Established 1857 Chicago, Ill., U.S.A.
7200 McCORMICK ROAD • CHICAGO 45, ILLINOIS

XUM

LOW COST SOURCE OF

NEW REVENUE



SUTTLE
Drive-Up Booths
BRAND NEW-
for Independent Telephone Men

Use-surveys prove that existing Suttle Drive-Up Booths are the most profitable outdoor telephone pay stations yet devised. Motorists phone from their cars and coin boxes jingle with increased revenues.

Easy to see—"Phone From Your Car" booths are equipped with brightly-colored traffic-stopping Plexiglas hoods. Can be supplied with "Scotch-Lite" or plastic lighted signs.* Lights* are positioned in concrete base or sign post.

Easy to use—Just form concrete base, position stanchion. Each Suttle Drive-Up Booth Kit is complete with a weather-proof heavy gauge steel directory box and pay station ringer box.

*Optional Equipment

Send your orders—today!
Only $99.50 f.o.b.
Lawrenceville, Illinois

Write for literature, prices and Suttle's full Telephone Booth Catalog.

See Your SUTTLE Catalog

Serving Independent Telephone Men Since 1910

Suttle EQUIPMENT CO.

DEarborn 2-3108-9
135 S. La Salle Street
CHICAGO 3, ILLINOIS

telephone companies, both Independent and Bell, are giving increasing attention and thought to the selection of new employes. The old method of "hire and fire" until a good man is found is entirely too expensive under present labor conditions. In the large cities, big companies maintain employment offices staffed with experts in this line of work and equipped with the latest tests for ascertaining the true qualifications of an applicant. The whole project is often headed by a vice president.

However, this has not become an exact science. The best employment manager will at times hire a man who becomes a failure; therefore, we can presume that at times he passes up an applicant who would have been a great success. Nevertheless, this scientific attack on the problem gives very much better results than the old haphazard method.

A small telephone company cannot go into this so deeply. Nevertheless, they can make profitable use of some of the methods used in a large employment office and the expense will be negligible. Even the very small company that employs only one "man of all work" with an average replacement interval of 10 years or more, can profit by a more thorough study of this subject on the rare occasion when they hire a new man.

In a future article we will have some specific suggestions along this line, such as: How to conduct an interview with an applicant so as to bring out the truth about his qualifications and information on some simple and inexpensive tests that may be used.

DATA TRANSMISSION

Continued from page 48

whereby the mark was on one frequency and the space on another. The latter method can result in better signal to noise ratio performance.

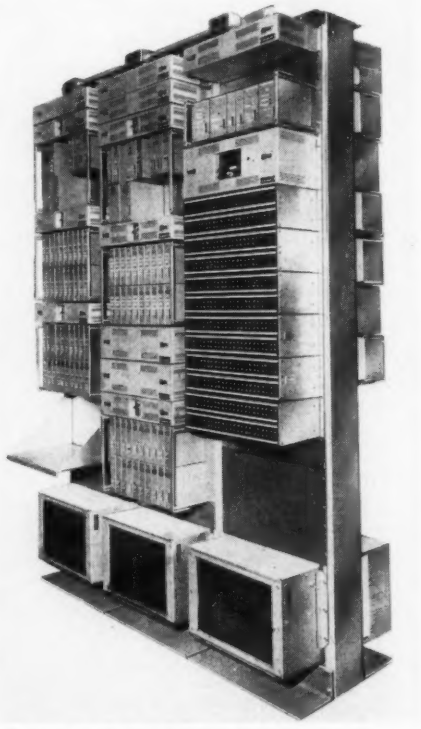
An extension of this thinking has brought about the idea of phase shift keying and this is one of the features employed in the Kineplex. By using phase shift, two channels of information are possible where only one existed before. For instance, if a single frequency in the voice range is pulsed by the business machine or other device, this single frequency would carry only the one channel.

If, however, the phase of this single frequency is shifted for mark and space instead of being pulsed on and off, an arrangement like this can result:

For one message, the mark can be 0° and the space can be 180°. A second message can be sent on the same tone at the same time by using a phase relation of 90° and 270° for the mark and space of the second message. Of course, when the two messages are being sent at once, the actual phase being transmitted over the line will be the composite of the two conditions mentioned above. This mixes the two together, but they are easily unscrambled.

For instance, the resulting vector can be thought of as lying in one of four quadrants of a circle. If the transmitted vector is in the first quadrant, it indicates channel 1 mark and channel 2 mark. If it is in the second quadrant it indicates channel 1 space and channel two mark. In quadrant 3, it would be space in both channels. In quadrant 4, it would be channel 1 mark, channel 2 space.

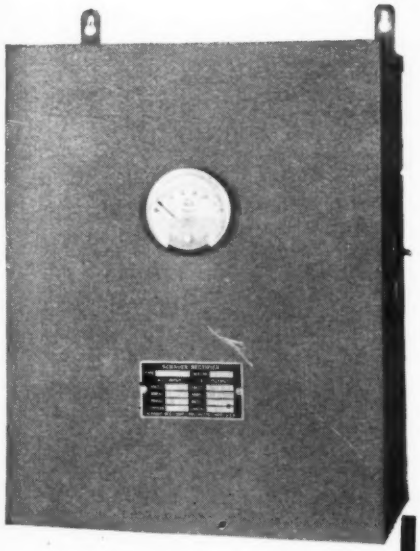
Another feature of the Kineplex is the use of channels only 110 cycles wide. A combination of the two features make possible a transmission of 3,000 bits per second on a telephone circuit which has a bandwidth of 3,000 cycles. A total of 40 teletype chan-



Typical of the kind of equipment customers are soon going to be using over telephone lines is this Collins Kineplex. This unit will funnel 40 Teletype channels over one telephone circuit—if that circuit is all it is expected to be.

Dependable Power

for Years-
and Years-
and Years-
of Service!



SCHAUER
ELECTROX

BATTERY ELIMINATORS
BATTERY CHARGERS

In sizes and capacities to meet every telephone power requirement.

See your Schauer Jobber.
Write for Bulletin 1465.

RECTIFIER DIVISION
SCHAUER
MANUFACTURING CORP.
4514 Alpine Ave.
CINCINNATI 42, OHIO

nels with a speed of 100 words a minute each could be handled on such a facility with this equipment.

The Collins equipment, which utilizes transistors, uses electro-mechanical resonators for the different channels. These resonators normally have a Q of about 1,000, but are electrically connected by a feedback circuit which puts the device near the oscillating point. When a received pulse enters the resonator, then, no energy is dissipated, so a theoretical Q of infinity is obtained. Following the build-up of energy from each pulse, the resonator is allowed to "ring" for a moment, and this stored energy may be used as a 0° phase reference for the next pulse.

In any system of this sort, the optimum efficiency and signal to noise ratio is achieved when the detector at the receiving end operated only for the duration of a pulse. If the detector only samples a part of the pulse, the maximum transmitted signal is not used. If the detector receives before or after the pulse length, then it receives noise only when the pulse is not on. Either of these conditions degrades the signal to noise ratio.

The Collins Kineplex improves on this situation by means of a system which they call predicted wave signaling. It uses a synchronized gating system which permits the detector to receive only for the duration of the transmitted pulse. The gate which steers the pulse into the detector is closed both before and after the pulse is transmitted.

This data transmission system has been tried out on radio, microwave and telephone wire line circuits and found to be highly satisfactory.

The system has considerable timing leeway in connection with the received pulses. The receiver gating circuit is arranged so that a phase delay of as long as 4.2 milliseconds on the telephone line will still produce satisfactory results.

This means the amount of delay of one channel as compared to another. In systems of this sort, if all channels are delayed by the same amount, no harm ordinarily results. It is when the different channels arrive at different times that the trouble starts.

The Collins Kineplex System transmits a 2,915-cycle tone which is keyed on and off at the synchronous system rate. This tone, after detection, furnishes the timing for the basic keying pulse in the receiver. Errors will not be incurred in the detection process if the channel tones are not disturbed more than plus or minus 2.1 milliseconds from the synchronizing tone.

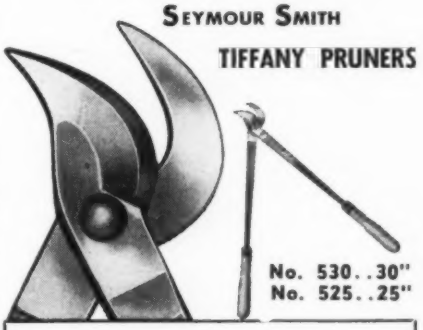
One of the methods used by tele-

Do More With Less Help!

SEYMOUR SMITH
TELEPHONE PRUNERS

Illustrated above is No. 11 Tree Pruner with center cut action by tempered steel blade that easily handles 1" branches. Head is reinforced malleable iron. Spruce poles with telescoping aluminum joints. For heavier work No. 12-18, capacity 1½". Also Pole Saws.

for clearing brush...
SEYMOUR SMITH
TIFFANY PRUNERS



No. 530..30"
No. 525..25"

Hand forged throughout. Fast and easy double cut action with thin blades shaped to "draw in." Improved bolt and nut joint, through handle and riveted grip fastening.

FAST-CUTTING SAWS

Blades of Swedish charcoal steel. Large, deep teeth with heavy set to prevent binding. Hand and Pole models for all work up to chain sawing.

Quality Tools
SEYMOUR SMITH
Since 1850

Send for FREE literature
Seymour Smith & Son, Inc.
4512 Main St.,
Oakville, Conn.

TAKE ALL YOUR PLANT MEASUREMENTS

the Modern Way

WITH A

Rolatape

MEASURING WHEEL

Telephone men from coast to coast are turning to the ROLATAPE for their outside plant measuring....and small wonder! For ROLATAPE is the quick, economical, *dependable* way to measure all distances, over all kinds of terrain. Simple to operate, ROLATAPE measures and records total as it is rolled along. Rugged, yet lightweight, it folds compactly for easy handling.

The Model 400 measures and records total up to 19 miles.

Send Today for Complete Information:

ROLATAPE Inc.
1741 14th Street, Dept. T-12
Santa Monica, Calif.

Send me free details on ROLATAPE:

NAME_____

FIRM_____

ADDRESS_____

CITY, STATE_____

DEPARTMENT OF TECHNOLOGY
BUFFALO AND ERIE COUNTY PUBLIC LIBRARY

phone companies to examine the phase characteristics of a telephone line is to use a measuring set that is specifically designed for this purpose. The Western Union 450-A measuring set will measure the direct delay on a telephone line from which the phase delay can be derived.

IN THE NATION'S CAPITAL

Continued from page 21

"The Michigan Supreme Court recently stated in General Tel. Co. vs. Public Service Commission, 341 Mich 620, that the commission should consider capital costs 'as they will influence yields for a reasonable time in the future.' I think it is highly conservative to employ 3.3 per cent as the cost of debt capital, and this is the figure I have adopted."

In the light of recent money bond issue interest requirements, Commissioner Hunt's view would seem to be not only conservative but almost an understatement. Hunt decided that the Michigan Bell company ought to be allowed rates which would yield earnings of 7 per cent. In the view of testimony by both company and staff witnesses, the cost of capital is now up and going still higher. A reasonable rate of return is not a single precise figure. But Hunt felt that a commission at least should not go *below* the cost of money if a utility company is to maintain and expand its service.

The trouble with placing too much emphasis on the cost of capital in determining the rate of return is that it tends to penalize the well-managed, efficiently run company with good credit while rewarding a poorly managed, less efficiently run company with poor credit. Obviously the "good" company is going to be able to raise capital at a lower cost than the "poor" company—all other things being equal.

But what is the incentive to management to operate a "good" company if it can have its rates fixed on the basis of cost of capital required for a "poor-type" company? As Commissioner Hunt put it: ". . . if each company were to earn only the cost of money to it, the poor company would be rewarded by higher rates to the disadvantage of its customers and the well run company would be penalized."

One other point covered in Hunt's remarkable dissenting opinion deals with the poorly understood factor of "attrition." This is the erosion or draining away of utility earnings due to the impact of inflation on continuing operations and plant commitments.

Under such conditions, theoretical rate allowances are rarely actually earned in terms of profits received. There is generally a difference between what a company was supposed to earn and what it did earn under a specifically authorized schedule. And the utility company under the present regulatory law, can never catch up with this difference because past deficits in earnings cannot be considered in fixing future rates. It is an absolute loss—gone beyond recall. Hunt explained this as follow:

"I am also aware that the factor known in regulatory circles as 'attrition' continues to exert a depressing effect on earnings. As utilities add greater quantities of new plant at costs which are far above the cost of existing plant, requirements for depreciation and for earnings on the higher investment are continually rising.

"The hope expressed by the majority that 'other offsetting factors' may nullify the effects of attrition is contrary to all recent experience. This has been a major factor in requiring repeated rate increases during the past few years.

"Because of this factor and steadily increasing costs, a rate schedule is often unrealistic by the time it is ordered. The commission knows that the company has most of the time been unable to earn even the return which the commission found proper.

"I believe that a rate of return somewhat above the bare cost of capital is appropriate to allow for attrition which accompanies a large expansion program in a period of high prices. The low return allowed by the majority opinion overlooks this factor."

Hunt's Swan Song

Readers may wonder why this correspondent has placed so much stress on a dissenting opinion by a commissioner who is not even a commissioner any more. The reason is that the majority opinion will be duly reported in full text. And there will be other opinions by other majorities along the same lines. Probably because it was his "swan song," Commissioner Hunt has said some things here that have needed to be said; but which many commissioners might consider to be unpopular things to say.

For example, with all this talk about cost of money, just how much earnings are required to maintain financial credit for the Bell System—as a whole? There was some interesting testimony on this, in the Michigan Bell case, by both the staff and company witnesses.

The staff witness testified that at least $12.85 a share was required for earnings on American Telephone & Telegraph Co. stock to maintain Bell System's financial credit. To produce such earnings would require a return

"ONE QUICK CUT!
To Clear Lines FASTER!
PORTER PRUNERS

The Quickest and Easiest Way For All Above-The-Ground and On-The-Ground Clearing

Made Rugged — for Rugged Work and long, trouble-free service. Blades are high quality alloy steel forgings that stay sharp longer. Small compact heads for narrow crotches. Fewer working parts. There's over 75 years of cutting "know-how" built into every Porter Pruner.

TYPE RP

TYPE RP POLE PRUNER
Long Arm plus pulley for greater leverage. Light and easy to handle. Capacity 1" green wood. Choice of solid poles (8' to 12') or jointed poles (8' to 16').

NEW TYPE M POLE PRUNER
Economical in cost but perfect in performance. Double steel hook eliminates bending and breaking. Simple mechanism — spring cannot catch or interfere when cutting. Capacity 1" green wood. Choice of poles as above.

THE FAMOUS FORESTER HEAVY DUTY BRUSH CUTTER
Faster and safer for clearing brush & cutting roots. The only cutter with the exclusive slide shift which *increases power during cutting operations.* Comes in two sizes. Cuts up to 2" green wood and leaves flush, flat-topped stumps.

TYPE M

FORESTER

Your Company can profit by the use of Porter Pruners

See them all in the Porter Catalog. Write for it today.

H. K. PORTER, INC.
Somerville 43, Massachusetts

of 8.5 per cent on equity capital or 6.77 per cent on total capital.

Those were the lowest figures supported by *any* testimony in the Bell case. And it is obvious that 8.5 per cent will not produce $12.85 of earnings per share unless *all* capital earns at this rate and on the average. If a rate base is used which is less than all capital committed to the service—which, in other words, excludes some capital from earning any return—then there will be a deficiency, unless a higher return is allowed on that capital which *is* included.

Then, there was Hunt's comparison of telephone rate increases with other price increases since the end of the war. The Michigan Bell company has obtained rate increases averaging about 29 per cent in the postwar period. Its rates are among the lowest for comparable service. And its rates have not increased as much as the cost of living generally or as much as wages.

Therefore, Hunt makes the interest-

Answers to Questions On Page 56

(1) The abbreviation is CDO.

(2) Answer with "Operator" unless the trunk group is for toll calls only, in which case say "Long Distance." Having answered with "Operator," if the customer then asks for "Long Distance," say "This is Long Distance."

(3) Proceed with the call in the usual way except that if your dialing directions indicate that you will not receive flashing busy signals from the called CDO, instead of cutting out when you would normally do so, remain cut in long enough to hear a ringing or busy signal.

(4) The operator will proceed in the usual way except that if her position information indicates that she will not receive a flashing busy signal from the called CDO, instead of cutting out when she would normally do so, she will remain cut in long enough to hear a ringing or busy signal.

(5) Follow the directions you have been given for investigating, interpreting, and reporting it. Understand the nature of the alarm signals for each community automatic office you serve and be prepared to take the prescribed action.

NOW... CHANCE PIKE POLES ARE LAMINATED!

For greater uniformity... greater rigidity!

Now...Chance Pike Poles are made by bonding together carefully selected Douglas fir boards. Laminated Pike Poles have many advantages over the old, single board pike pole. They're more rigid. They're more uniform. Each board reinforces the other.

STANDARD PIKE

SAFETY PIKE

SAFETY PIKE — *Point can be reversed as shown in circle, for safety in handling and transporting between jobs.*

PLASTIC PROTECTED

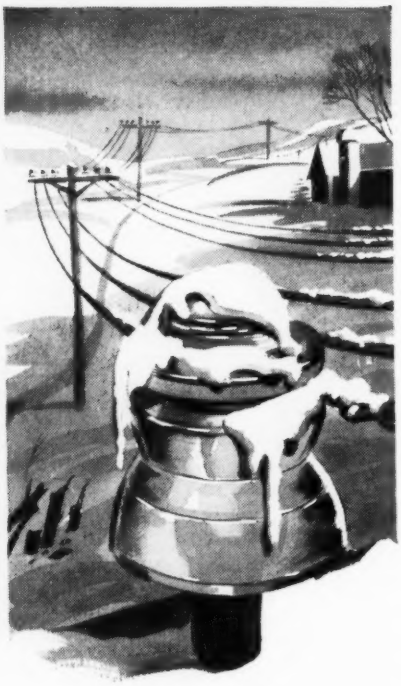
Chance *laminated* Pike Poles are available with tough Maplac plastic coating. Splintering of the wood is eliminated. Lost-time hand injuries, caused by splinters, are avoided. *IT PAYS TO BUY HIGH QUALITY IN A PIKE POLE.* Only on a Chance pike pole will you find the steel reinforced butt which protects the end of the pike. And only *laminated* Chance pike poles are available with Maplac protection.

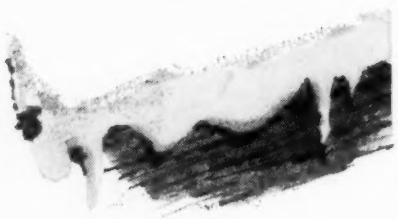
Write for the full story today.

CT55-1A

A·B·CHANCE CO·
CENTRALIA, MISSOURI
SAN FRANCISCO, CALIFORNIA

XUM





Strong!

This Armstrong Glass Insulator (Model #1) with double petticoat has a long leakage path for use on long-distance lines. The bottom shelf of its square groove is reinforced to support heavy ice loads.

All Armstrong Insulators are designed and constructed for extra strength. They're made of rugged industrial glass capable of withstanding punishing line strains and severe thermal shock. For full details, write Armstrong Cork Company, Glass and Closure Division, 295 Fifth Avenue, New York 16, N. Y.

Watch Armstrong Circle Theatre every other Tuesday evening on NBC-TV

Armstrong
GLASS INSULATORS
for communications . . . for power

ing suggestion that the real cost of telephone service has actually "declined over the past few years." Certainly the telephone ratepayer has not been treated unfairly.

Hunt's conclusion on this is also worth repeating:

"The telephone investor . . . I think, has fared far worse than other investors. The real value of his investment and his dividend income has declined while other businesses have kept pace with inflation.

"Even other regulated utilities, used by the staff for comparison, have had substantially greater increases in earnings, dividends, and price than the Bell System.

"As I understand our legal duty, it is to strike a fair balance between the interests of ratepayer and investor, not to favor one at the expense of the other. However, I do not believe these interests are basically opposed, as this statement might indicate, but that the best interests of both consumers and investors are served by rates which will produce good earnings.

"I believe it is our duty not to set rates at the lowest possible level, but to set reasonable rates which are neither too high nor too low."

Obituary

FRED C. LICKTEIG, 50, general traffic manager for General Telephone Co. of Michigan, died in Owosso, Mich. on Nov. 25. Born July 27, 1907, in New Haven, Conn., he graduated from Hillhouse high school in New Haven in 1925. Mr. Lickteig attended Yale University.

From 1926-1929, Mr. Lickteig was associated with Southern New England Telephone Co., moving to Detroit to join Michigan Bell Telephone Co., an association which lasted for 17 years. In 1950, Mr. Lickteig was appointed general traffic manager in the former Union Telephone Co. which subsequently has been merged into General Telephone Co. of Michigan. At the time of his death, Mr. Lickteig was located in the general offices at Muskegon, Mich.

Surviving are the wife,; two sons, Fred Jr. and Rodger, and a daughter, Doris.

N. Y. Telephone Announces Two New Appointments

G. Wallace Bates, general attorney for the American Telephone & Telegraph Co., will become vice president and general counsel and a director of the New York Telephone Co. on Jan. 1, 1958, it was announced by Keith S. McHugh, president, after a meeting of the board of directors on Nov. 27.

Mr. Bates will succeed Ralph W. Brown, who retires effective Dec. 31, in accordance with the provisions of the employes' benefit plan. Mr. Brown has been vice president and general counsel as well as a director and member of the executive committee since 1943.

Concurrently with the change, Eric B. Nelson, general attorney for the New York company, becomes associate general counsel.

The recent convention of the Alabama-Mississippi Independent Telephone Association held in Birmingham, Ala. (TELEPHONY, Nov. 30, p. 56), was reported to be one of the best they've ever held. Over 200 were in attendance. Pictured above is the new board of directors. Front Row (left to right): Millard Weaver of Collinsville, Ala.; Earl McDonald of Ackerman, Miss.; Carl Kerk of Dothan, Ala.; Bill Corman of Atmore, Ala.; W. J. Holladay of Fayette, Ala.; Fred Thomas of Eclectic, Ala., and H. W. Vaughan, Chickamauga, Ga. Second Row: D. L. Fail of Bay Springs, Miss.; L. G. Vaughan, secretary and treasurer, Florala, Ala.; Lon J. Darley of Olive Branch, Miss.; Ralston H. Robertson, president, Bayou La Batre, Ala.; DeForest M. Nolen of Ashland, Ala.; Carl Smith of Leeds, Ala., and J. A. Miller of Fruitdale, Ala.

EXPANDING on a BUDGET?
Then You Should Know About

BUCKEYE Reconditioned Switchboard Equipment

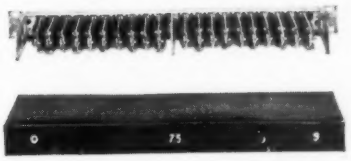
RELAYS (Line & Cut-off)
W. E. #AB-1 and AB-2
Kellogg #2029-SAH and 2048-SR
Kellogg #2029-SFG and 2048-SR
Kellogg #2093-CEA and 2059-CDG
S. C. #194-A and #193-BB

PLUGS
W. E. #289-A Operator
S. C. #23 Operator
S. C. #53-X Switchboard

DROPS and JACKS
W. E. #22-C on 89-B Mtg. (5 per)
Kellogg #301-DJE on 329 Mtg. (10 per)
Kellogg #509-DJE on 495 Mtg. (10 per)

SWITCHBOARDS
W. E. #506-B Cordless PBX
Kellogg Masterbuilt Cordless, 3 Trunks, 10 or 12 stations
Federal #25-C PABX with Attendants Key Set and Power Supply
S. C. 5 Positions Jr. Multiple Switchboard. Cord circuit per S-10119. Divide Code Ringing
Kellogg 5 Positions 6-800 Low Type-Universal cord circuits and 5 party Ring Keys

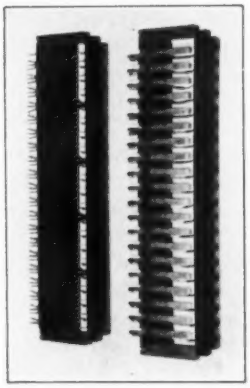
TELEPHONES
Leich #901 Magneto Handsets
Federal #804-A Magneto Handsets
A. E. Type 40 Monophones with Dials and Synchromonic Ringers
W. E. #302 with 5 HA Dials and B1AL Ringers
Type "C" Magneto Handset Wall 5 Bar.
S. C. #1212 with Harmonic Ringers



PROTECTION
W. E. #1268-A, 1269-A
Cook #100 (20 per)
Cook #3800 (20 per)

BLOCKS, TERMINAL
W. E. #65, 142-A, 224-A, B
W. E. #92, #93

KEY BOXES
W. E. #6017-E (3-Way)



RECEIVERS and TRANSMITTERS
W. E. #635-A Transmitter
W. E. #F-1 Transmitter
Roanwell #F-1 Type Transmitter
W. E. #HA-1 Receiver
Kellogg #65-A with Headband
S. C. #24562 Trans. for 1212 phone
S. C. #34242 Rec. for 1212 phone

COILS
W. E. #76-A, 25-A Repeating
W. E. #94-E, 94-F, 94-N, 120-G Repeating
Kellogg #21-A, 20-A, 19-A Repeating
S. C. #11-A Repeating
W. E. #13, 113-D Induction

JACK STRIPS
W. E. #92 on 138 (10 per)
W. E. #49 on 141 (10 per)
W. E. #295 on 112 (20 per)
W. E. #295 on 136 (10 per)
W. E. #141 on 112 (20 per)
W. E. #141 on 115 (20 per)
W. E. #275 on 217-A (20 per)
W. E. #49 on 114 (20 per)
Kellogg #267 (10 per)
Kellogg #269 (10 per)
Kellogg #273 (10 per)
S. C. #135 on 80 (10 per)
A. E. #D-42428-EO (20 per)
A. E. #D-42428-A4 (10 per)

LAMP STRIPS
W. E. 12-B on 137-B (20 per)
W. E. 12 on 101 (10 per)
W. E. 12 on 125 (10 per)
W. E. 12 on 134 (10 per)
W. E. 43-A on 278-B (20 per)
Kellogg #41 (20 per)
Kellogg #34 (10 per)
S. C. #121 on 80 (10 per)

OVER Thirty years of rebuilding communication equipment have given Buckeye the know how for the proper reconditioning. Efficient technique and correct processing methods enable many of our customers to justify the purchase of dependable equipment . . . at a cost considerably less than new equipment. There's more than a lick and a promise to Buckeye's reconditioning program. Every piece of equipment is dismantled and completely overhauled. That's why you can be sure of inside dependability with outside attractiveness. Write us today, concerning your equipment problem. We may have just what you have been looking for.

Whatever Your Needs . . . It Pays to Call BUTELCO!

BUCKEYE TELEPHONE & SUPPLY CO.

1250 Kinnear Rd. **HUdson 8-0655** **Columbus 21, Ohio**

XUM

HERE'S YOUR PARTY

J. Fred Elmen

Fred Elmen, Manager of Kellogg's Southeastern Sales Division, knows the importance of service. Fred joined Kellogg in 1952 after 10 years diversified experience with Federal Telephone and Radio Company, U. S. Army Signal Corps, and Bell Telephone Company. When you have a special product, line, or inventory problem, Fred is the man to call.

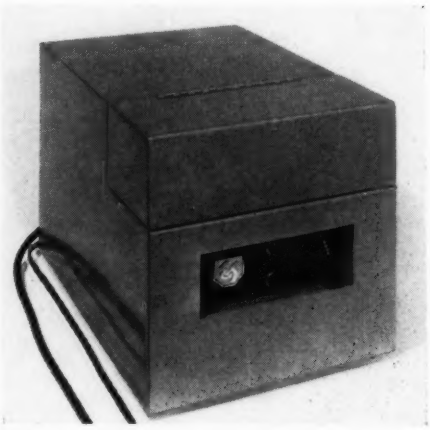
Write or call Fred at:
1594 Southland Circle, N.W.
Atlanta, Georgia
Phone: Sycamore 4-2441

KELLOGG
A DIVISION OF I T & T

KELLOGG SWITCHBOARD AND SUPPLY COMPANY
A Division of International Telephone and Telegraph Corp.

News on New Products

ELECTRONIC SENTRY—Electronic Secretary Industries, Inc., maker of automatic telephone answering equipment, has introduced a new unit capable of electronically and automatically detecting a wide variety of abnormal conditions and of alerting a designated person by telephone.



The device, known as the "Electronic Sentry," is designed to provide an instant, automatic alert to personnel responsible when the possibility of danger due to fire, pressure, water levels, temperature, theft or any other hazardous conditions exist.

When an alert condition occurs, a primary detecting device such as a thermostat, a pressure control, a capacitive burglar detector, a water level measuring gauge, or any control capable of closing a switching circuit, causes the Electronic Sentry to go into action.

The Electronic Sentry will then (1) connect itself across the telephone line; (2) dial a predetermined telephone number electronically, and (3) by means of a pre-recorded message, inform the person who answers of the nature of the trouble. The warning message is transmitted repeatedly so that if it is not understood the first time, repetition will insure comprehension.

At the end of a predetermined time, the unit will disconnect momentarily from the telephone line. If the condition that caused the warning is not corrected, the Electronic Sentry will again dial the number and repeat the warning message until the warning message is acted upon.

The unit, of compact and rugged construction, is 8 inches wide, 8¼ inches high, 11¼ inches long and weighs 17½ pounds. It consists of the primary detection device, specially designed record player, electronic relay amplifier and audio amplifier.

The company says that the Electronic Sentry can prove invaluable in refineries, warehouses, industrial areas, institutions, pumping stations, commercial establishments and homes.

Electronic Sentry units will be distributed by Automatic Electric Sales Corp. and Leich Sales Corp. Request NP765.

•

ELECTRICAL INSULATING COMPOUND TO CUSHION IRREGULAR SHAPES—Volseal electrical sealing compound, in tape form, is now being marketed by the Johns-Manville Dutch Brand Division in Chicago.

TELEPHONY PUBLISHING CORP.
608 S. Dearborn St.
Chicago 5, Ill.

Please have the manufacturer send me without obligation the literature indicated by the following numbers:

NP765_____; NP766_____; NP767_____; NP768_____;
NP769_____; NP770_____; NP771_____; NP772_____;
NP773_____; NP774_____; NP775_____; NP776_____;
NP777_____; NP778_____.

Name_____ Title_____
Company_____
Street_____
Town and State_____

12/7/57

DEPARTMENT OF TECHNOLOGY
BUFFALO AND ERIE COUNTY PUBLIC LIBRARY

Seasons come
and
Seasons go—

No matter

what the Season—

our services are

at your command

★

Your inquiries
are solicited

★

GUSTAV HIRSCH
ORGANIZATION, INC.

1347 WEST FIFTH AVENUE
COLUMBUS, OHIO
Telephone: HUdson 8-0611

PRESSURIZED CABLE SYSTEMS

The need for an automatic device to stand guard at intervals along pressurized cables has long been recognized. Now United Electric Controls has the answer . . . The Telephone Cable PRESSURE-GUARD.

Developed by U.E., in collaboration with the Bell System, the PRESSURE-GUARD is now available to all Telephone Companies as an aid in reducing cable maintenance costs.

In the past the location of a cable leak was a matter of man hours in climbing poles and manually checking pressure points. When the pressure guard detects a pressure drop it introduces an electrical resistance . . . which indicates at a central monitoring source a cable leak and the location.

Specifications Pressure-Guard

Field Adjustment Range	0 to 15 PSI
Factory Setting	2 ±¼ PSI on falling pressure
Pressure Response	4 ±½ oz.
Proof Pressure	30 PSI
Electric Rating	0.01 amp 110V DC
Load Resistor	Carbon composition 330,000 OHM 1 watt
Take-Off Tube	Tinned Copper 6′ x ¼″ x 0.035
Drop Wire	6′ Type SJ0 #18 stranded 0.2 conductor
Size	6″ x 4½″ x 2½″
Approximate Weight	1¾ lbs.

These specifications may be modified in a great variety of ways to meet the requirements of any given application.

UNITED ELECTRIC *manufactures a complete line of temperature, pressure, and vacuum controls. For applications requiring custom-built units or modified standard units, call upon a UE application engineer for recommendations. Write for complete specification and pricing data on the Telephone Cable Pressure-Guard. Similar data available on all other UE controls.*

UE® United Electric Controls COMPANY
85 SCHOOL STREET, WATERTOWN, MASS

XUM

TAKE A BIG STEP TOWARD **SAFETY**
WITH **DUO-SAFETY LADDERS**

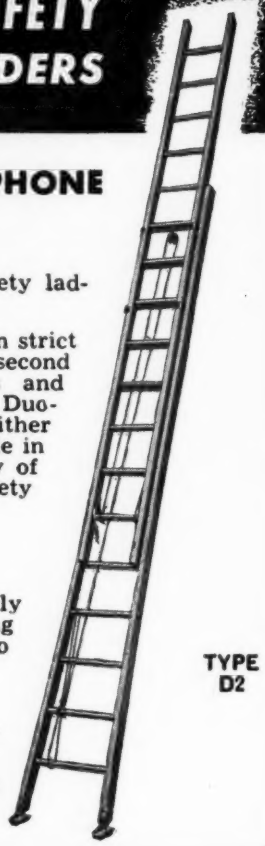
... CUSTOM DESIGNED FOR TELEPHONE MAINTENANCE WORK!

Here's one fine example of the many Duo-Safety ladders ideal for telephone maintenance work.

Type D — a truly great extension ladder built in strict accordance with safety regulations. Rungs are second growth hickory, reinforced with steel rods and equipped with special automatic locks and Duo-Safety's famous Safety Shoes. Made with either straight or parallel side rails, Type D is available in one, two or three sections — in a large variety of sizes. Write for free catalog on all Duo-Safety ladders.

IMMEDIATE DELIVERIES!

Duo-Safety ladders will be shipped immediately upon receipt of order! A planned stock-piling program assures really fast action — there's no delay the Duo-Safety way!



TYPE D2

For Information, Contact Your Supply House, or

DUO-SAFETY LADDER CORP.
809 Ninth Street • Oshkosh, Wisconsin

let's make a telephone call...

The FIRST Book of Its Kind..

...introducing the reader to the world of telephone communications

Written by a leading educator in an easy to read style, and beautifully illustrated with authentic photographs.

Some chapters included are:

- *Planning and Engineering*
- *School to Home Service*
- *Direct Dialing Service*
- *The Solar Battery*
- *The Nike*
- *Radio and TV Monitoring Service*
- *Mobile Telephone Service*

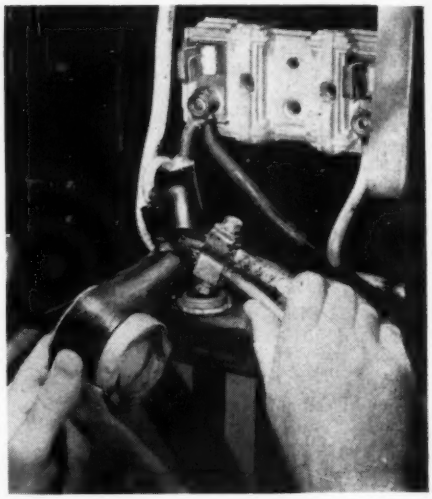
"LET'S MAKE A TELEPHONE CALL" is currently being utilized by Telephone Companies throughout the country as a Customer Relations tool, for use in Employment Procurement Programs as well as inclusion in the Teletrainer and Telezonia kits.

The Cover price is $1.50 . . .
quantity discounts available by writing to –

D "a diamond book"

DIAMOND BOOKS
A DIVISION OF KERR PRINTERS, INC.
3555 Hayden Ave. • Culver City, Calif.

Joining the line of Dutch Brand electrical tapes, Volseal, a product of Johns-Manville research, is an easy-to-handle, high dielectric insulating material used primarily to seal and build-up cable splices. Volseal conforms to irregular shapes, acts as an excellent



padding-insulator to round out sharp corners around terminals, connections, bus bars and motor lead junctions, the company states.

Packaged in individual metal containers, each Volseal roll is 1½ inches wide, 5 feet long and ⅛ inch in thickness. This ribbon-form, putty-like substance needs only to be wrapped and shaped into place, to fill and seal every hollow or contour. Once applied, it forms a smooth working surface that's ready to be overwrapped by electrical tape.

Volseal has an average dielectric strength of 445 volts per mil of thickness and is capable of continuous performance at 160 degrees F. Permanently plastic, it will not dry out, become brittle or excessively hard, the company reports. It resists acids and alkalies, including brine solutions, soaps and detergents. Request NP766.

•

LIGHT-WEIGHT STATIONARY BATTERIES—The Industrial Division of Gould-National Batteries, Inc., has introduced a new line of light-weight, space-saving stationary batteries for switch gear, alarm system, telephone, control, signaling, emergency light and other applications where batteries are used as stand-by emergency power.

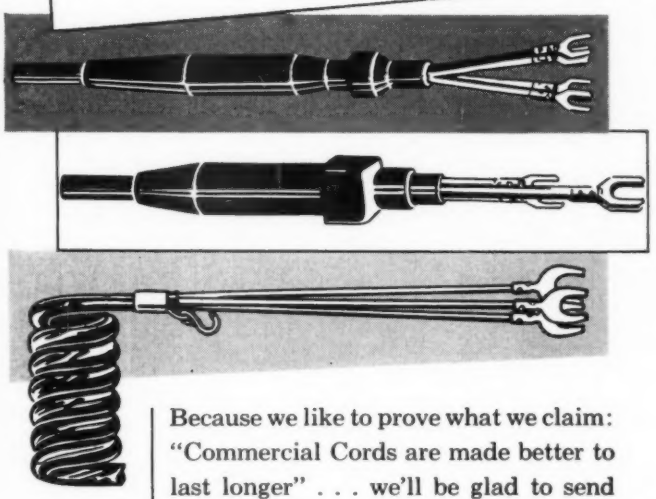
Available over a wide capacity range —from 40 ampere-hours to 960 ampere-hours — the new line of Plante batteries is designed for full float service.

The company states that a rugged Plastrite jar, lighter in weight than conventional containers, saves 30 to 40 per cent on floor space requirements,

IF YOU WANT PROOF IN ADVANCE

WE INVITE YOU TO SERVICE-TEST

COMMERCIAL TELEPHONE CORDS



Catalog and Prices on Request

WIRE . . . PHONE OR WRITE . . !

Because we like to prove what we claim: "Commercial Cords are made better to last longer" . . . we'll be glad to send you whatever you need to run exacting tests on any Commercial Cords:

- **Switchboard (with or without plugs)**
- **Instrument** • **Operator's**
- **Retractable Handset Cords***

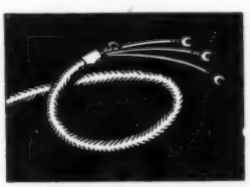
in NYLON . . . NEOPRENE . . . MERCERIZED COTTON

**Retractable cords come only in Neoprene*

COMMERCIAL CORD & SUPPLY CO., INC.

CLIFTON SPRINGS, N. Y.

Phone: Howard 2-5111



QUALITY CORDS FOR ALL MAKES AND TYPES OF TELEPHONE INSTRUMENTS

YOU CAN COUNT ON IT!

IT'S AS SIMPLE AS ADDING ONE PLUS ONE! Kennecott lead-alloy sheathed Telephone Cable gives dependable, long-lasting service because of superior manufacturing techniques, *plus* rigid quality tests. For example, Kennecott's *exclusive* "Young Process" produces lead sheath, virtually free from oxides and impurities. Tests *prove* that this lead sheath is stronger—has a much higher life expectancy than ordinary lead sheaths. Contact the Chase sales office near you for full details.

IT'S KENNECOTT TELEPHONE CABLE

CHASE BRASS & COPPER CO., WATERBURY 20, CONN.

DISTRIBUTOR FOR

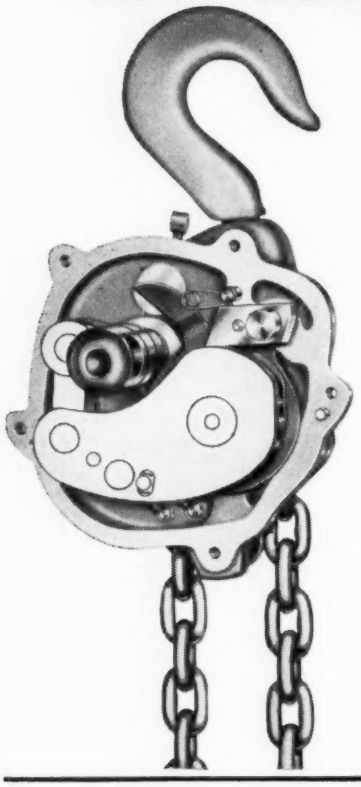
KENNECOTT WIRE & CABLE CO.

SUBSIDIARIES OF KENNECOTT COPPER CORPORATION

CHASE WAREHOUSES and OFFICES:

Atlanta	Cincinnati	Grand Rapids	Milwaukee	New Orleans	St. Louis
Baltimore	Cleveland	Houston	Minneapolis	Philadelphia	San Francisco
Boston	Dallas	Indianapolis	Newark	Pittsburgh	Seattle
Charlotte	Denver	Kansas City, Mo.	New York	Providence	Waterbury
Chicago	Detroit	Los Angeles	(Maspeth, L. I.)	Rochester	

New Compound Levers



make Coffing Super Powers the most efficient hoists in their class

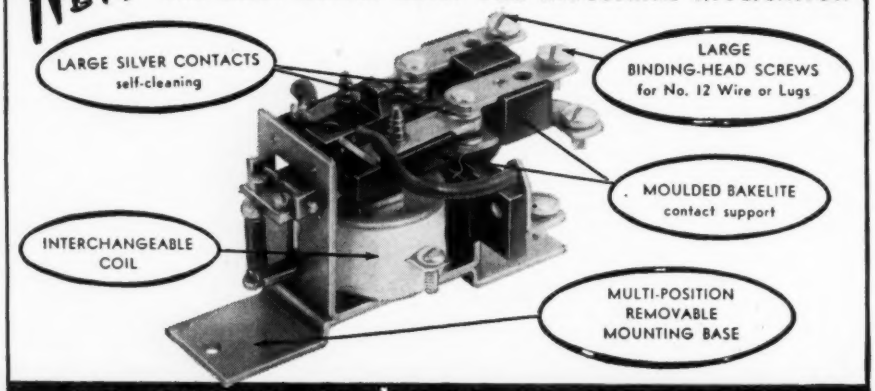
Super Power hoists are designed around a new compound leverage principle which enables workmen to raise loads with less handle pull than other hoists of the same capacities. Use of these compound levers also makes the hoists 20% lighter than competitive models.

Available in 1½ and 3-ton capacities in aluminum and 1½ to 5 tons in malleable iron, Super Powers offer sealed-in lubrication, "Safety Valve" handles, overload testing and constant load-locking ratchet-and-pawl construction. For complete details, consult your Coffing distributor, or write for Bulletin L-3. **Coffing Hoist Division, Duff-Norton Co., 808 Walter St., Danville, Ill.**

NEW **GENERAL PURPOSE RELAY**

(SERIES 130 RELAY)

THE MOST USEFUL RELAY FOR INDUSTRIAL APPLICATION


LARGE SILVER CONTACTS self-cleaning
LARGE BINDING-HEAD SCREWS for No. 12 Wire or Lugs
MOULDED BAKELITE contact support
INTERCHANGEABLE COIL
MULTI-POSITION REMOVABLE MOUNTING BASE

NO OTHER RELAY IS SO VERSATILE

SPECIFICATIONS

CONTACTS	RATINGS	COILS	MOUNTING BASE
Single-and-double pole	20 amp. at 115 V	AC & DC to 230 V	Metal strap or bakelite. Base can be rotated 90 degrees either direction for mounting convenience.
Single-and-double throw	60 Cy. AC or 24 V DC	(Interchangeable)	
Aux. DT contacts available	U.L. Approved	Power—2 watts	

DIMENSIONS Base—1" x 3⅞"

Request complete data on Series 130 Relay.

Wheelock SIGNALS INC

RELAYS W S LONG BRANCH, N. J.

permits increased battery room capacity and reduces storage rack requirements. Easier to handle because of reduced over-all weight, the high-impact-resistant plastic container will not bulge or warp under heat.

Construction improvements include a new leak-proof post seal which utilizes a soft rubber O-Ring in compression to seal the post against seepage. The acid-proof seal eliminates corrosion and wet covers, according to the company.

Positive plates made from a pure lead blank rolled to close tolerance and uniformly scored to present a large surface area, enables the plante to float at uniform charging rate throughout its life, it is stated.

Breakage of the plastic cover due to the weight of the battery elements is eliminated with an integral molded ledge on each end of the jars that supports all the element weight. The elements are prevented from shifting, even though a cell may be accidentally inverted, since the U-shaped plastic support is bonded to the jar edge.

New terminal posts have a high ratio of contact of posts to the connector assuring full current-carrying capacity with maximum voltage from cell to cell at all times. All posts have bolt holes in both directions that permit assembling cells end-to-end or side-to-side.

Technical data and engineering specifications are available. Request NP767.

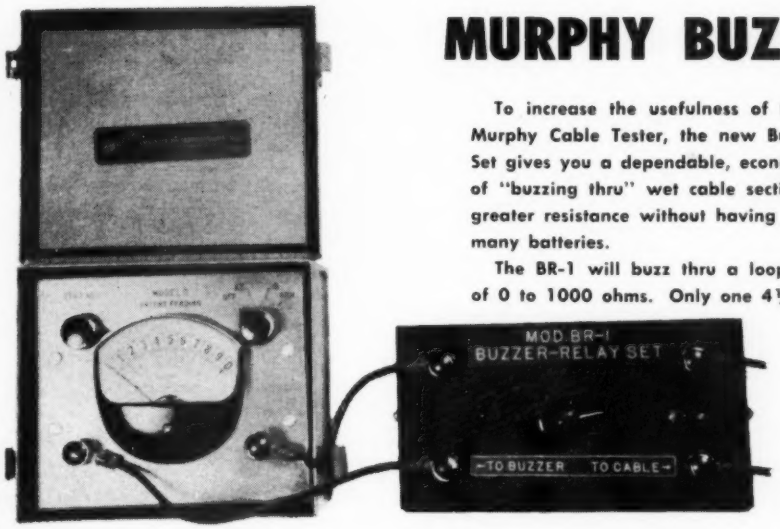
•

WALL ANCHOR—The Shorty Wing-Ding, a new hollow wall anchor specifically designed for use where clearance between partitions is small, has been announced by the Diamond Expansion Bolt Co., Inc.

The Shorty is used in fastening fixtures to plaster board or other wall paneling that has been secured to ¾-inch furring strips fastened to old wall

NOW YOU CAN BUZZ THROUGH WET CABLE SECTIONS AND NOT HAVE TO TEST FROM FIELD AND OFFICE ENDS

MURPHY BUZZER RELAY SET (BR-1)



To increase the usefulness of the famous Murphy Cable Tester, the new Buzzer Relay Set gives you a dependable, economical way of "buzzing thru" wet cable sections over a greater resistance without having to add too many batteries.

The BR-1 will buzz thru a loop resistance of 0 to 1000 ohms. Only one 4½ volt battery is used in the set and it is enclosed in a cabinet with a special "balanced armature" relay. Dimensions of the Murphy Buzzer Relay Set are 3½x6x3 inches. It is shipped complete with a pair of water proof cords for connecting to the Murphy Cable Tester, and a heavy duty 4½ volt battery.

Write for prices and additional information.

MURPHY ELECTRONIC RESEARCH DEVELOPMENT MANUFACTURE
ENGINEERING LABORATORIES, Inc.

4419 Tulsa • Houston 24, Texas

Order your new Model VC Test Cords for use with Murphy Cable Tester. Made of high quality, extremely flexible, test wire, they're insulation tested at 20,000 volts . . . assure no "leakage" readings.

ING-RICH
PORCELAIN ENAMEL
Telephone Signs

- Never fade, rust or stain
- Beaded reflective surface if desired
- Standard designs for quick delivery
- Special designs if desired
- Highest quality—fully guaranteed

Over a half-century of experience is reflected in the design and manufacture of Ing-Rich porcelain enameled telephone signs.

Three representative Ing-Rich Signs for independent telephone companies. Beaded surface increases night visibility.

Member, Sign Division, Porcelain Enamel Institute, Inc.
INGRAM-RICHARDSON MFG. COMPANY
BEAVER FALLS, PENNSYLVANIA

PAGE
LASHING WIRE

You get a neat and long-lasting job every time you use PAGE Stainless Steel Lashing Wire! Ideal for lashing conductor cables (lead or neoprene covered) to a strand messenger by Neale or Western Electric Machine. Coils tailored to fit machine specified.

3 GRADES • EACH IN 2 SIZES (.065 and .045)

Type 430 • for use with galvanized messengers
Type 302 • for use with stainless messengers
Type 316 • for use under severe corrosion conditions

Furnished six coils in cardboard carton (minimum order).

Other fine-quality products • You can depend upon PAGE Strand (Stainless or Galvanized Steel) and PAGE Stainless Dead-End Wire • See your Telephone Supply Distributor, or write our Monessen, Pa., office.

Page Steel and Wire Division
AMERICAN CHAIN & CABLE

ACCO

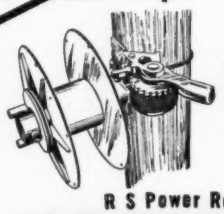
Monessen, Pa., Atlanta, Chicago, Denver, Detroit, Houston, Los Angeles, New York, Philadelphia, Portland, Ore., San Francisco, Bridgeport, Conn.

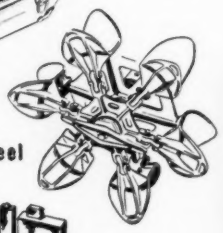
XUM

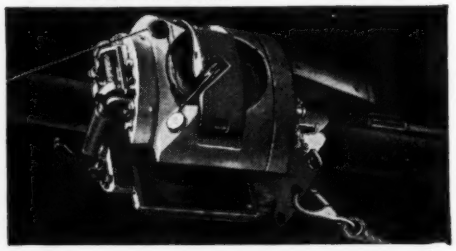
GENERAL
MACHINE PRODUCTS
COMPANY, INC.
Old Lincoln Highway at
Pa.Turnpike, Trevose, Pa.

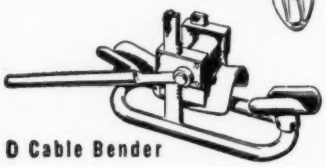
Aerial Tents
Cable Benders
Cable Blocks
Cable Lashers
Coaxial Cable Tools
Lashing Wire Clamps and Grips
Portable & Power Reels

Pressure Testing Kit


R S Power Reel


C R Power Reel




D Cable Bender

Distributed by Graybar

B, C, D, E & G Cable Lashers

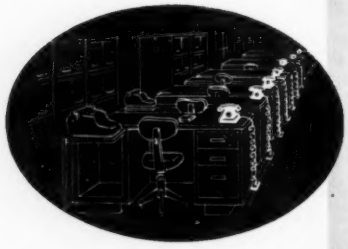
Special Purpose Tools To Specifications
Literature on Request

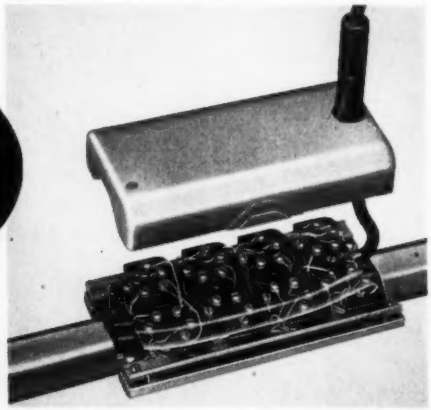
Over 500 various items of Line Construction Tools, Maintenance & Pressure-Testing Equipment in stock for immediate Shipment

SPECIALIZED COMMUNICATIONS EQUIPMENT SINCE 1918

GMPCO

at last! a low cost
MULTIPLE TERMINAL BOX
for Planned Telephone Systems





Designed to accept as many as four type 44 terminal blocks, Wiremold's new 2644T Multiple Terminal Box permits Planned Telephone Systems *without attaching fittings to office furniture.* Installation is easy—no new tricks or special equipment are needed. It can be hooked up to any overfloor system—and it's used with underfloor systems as well.

For a trip proof cable system, 2600 Pancake® is the flattest overfloor duct made. It's strong as a bridge, and easy to install with a few simple fittings.

Wiremold developed the first single terminal box for overfloor applications, and again is first with the multiple terminal box. For full information about these Wiremold developments, write:

THE WIREMOLD® COMPANY
HARTFORD 10, CONNECTICUT

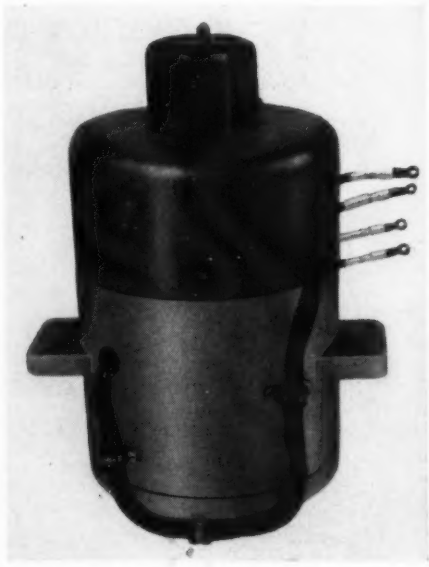
surfaces. The limited clearance afforded by the furring strip makes use of conventional wall anchors impossible.

Another application of the Shorty is in mounting fixtures on hollow-core doors.

One inch in length, the Diamond anchor requires a ¼-inch hole and will work on panels with thicknesses from $\frac{1}{16}$ to ⅜-inch. Tested for weights up to 200 pounds, the Shorty needs as little as ¾-inch clearance between partitions. Request NP768.

•

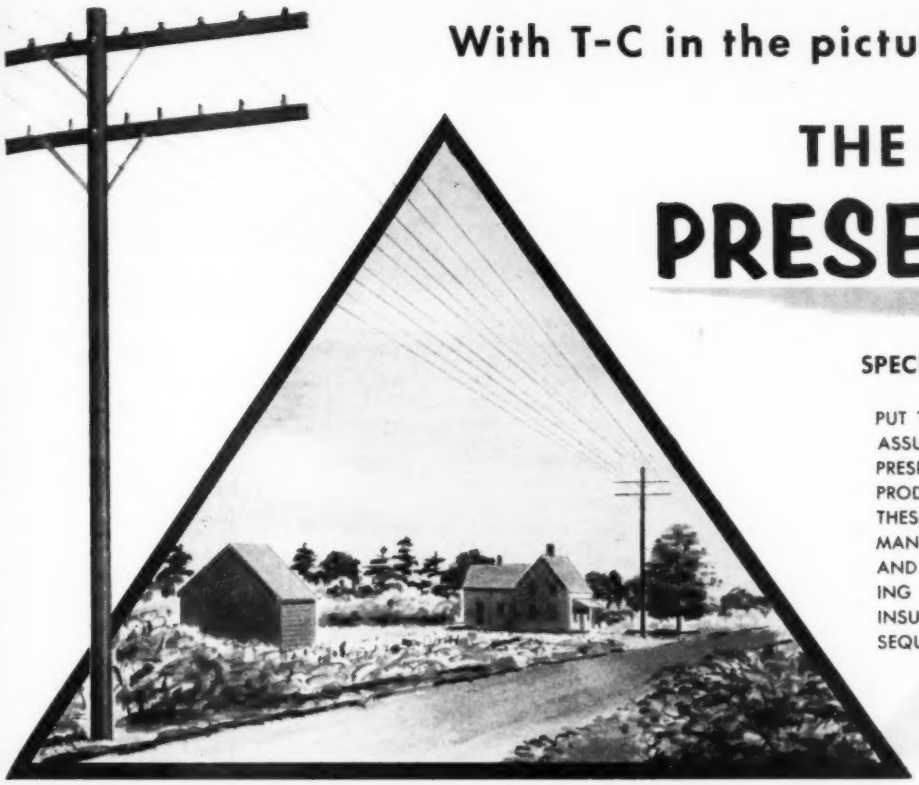
VERTICAL ROTARY CONVERTER —Added to the existing line of Kato Engineering Co. rotary converters is a new vertical unit. It can be mounted



easily in a vertical position as a component of test equipment or on ground mobile equipment which is supplied only with dc and must have a small source of ac.

This converter is 11¼ inches tall with a diameter of $7\frac{13}{16}$ inches. It weighs 65 pounds.

Precise 60-cycle output frequency is maintained within a fraction of a cycle as the attached speed governor holds



With T-C in the picture you get . . .

THE BEST IN PRESERVATION

SPECIFY T-C PRESSURE TREATED POLES

PUT T-C IN YOUR POLE PICTURE . . . THEN REST ASSURED YOU HAVE POLES WITH THE BEST IN PRESERVATION. HERE'S WHY, EVERY STEP IN T-C PRODUCTION IS SUBJECT TO PRECISE CONTROL. THESE CONTROLS COVER TIMBER SELECTION AND MANUFACTURE AS WELL AS MOISTURE REMOVAL AND TREATMENT. DEVELOPED AND REFINED DURING T-C'S 30 YEAR HISTORY, THESE CONTROLS INSURE YOU UNIFORM HIGH QUALITY AND CONSEQUENT MAXIMUM LONG LIFE.

Distributed by
AUTOMATIC ELECTRIC SALES CORP.
and LEICH SALES CORP.

TAYLOR - COLQUITT CO.
SPARTANBURG, SOUTH CAROLINA

PLANTS AT SPARTANBURG, SOUTH CAROLINA AND WILMINGTON, NORTH CAROLINA

For Your ENGINEERS

★ ★

THE ANALYSIS AND PRESENTATION OF ENGINEERING PROBLEMS
(In Two Volumes)

By HARRY C. WALKER, B.S., C.E., Ph.D.
Plant Training Supervisor, Southern Bell Telephone & Telegraph Co.

Volume I is a simple yet comprehensive treatment of the normal thought process applied to engineering problems. This volume also sets forth the principles of logical analysis in the light of emotional bias and other disruptive factors and explains how these may be applied, in writing, to engineering presentations.

Volume II is essentially an English handbook, written particularly for engineers. Using the decimal reference system, this book permits easy and rapid reference in the "language problems" of the engineer.

PRICE: $2.50 PER SET
SEPARATE VOLUMES: $1.50 EACH

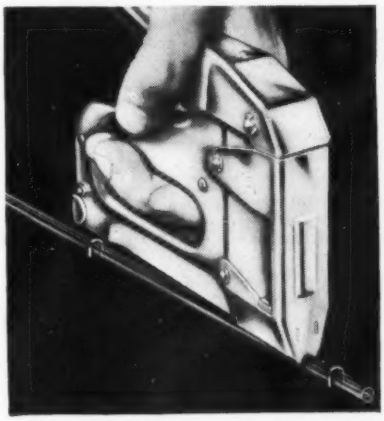
ORDER FROM

TELEPHONY PUBLISHING CORP.
608 SOUTH DEARBORN STREET CHICAGO 5, ILL.

Note: We also distribute Dr. Walker's other books:
ORAL EXPRESSION IN SUPERVISION
THE FUNCTIONAL ELEMENT IN SUPERVISION
THE HUMAN ELEMENT IN SUPERVISION
OFF JOB TRAINING

SAVE! Arrow's T-25 Staple Gun Saves You Time and Money!

For Wire Up To ¼" in Diameter . . . Bell, Thermostat, Radiant Heat, Telephone, Inter-com, Burglar Alarm, etc.



Tapered striking edge gets into tight corners!

T-25 AUTOMATIC STAPLE GUN *for wires up to 1/4" in diameter. Uses 3/8", 7/16" and 9/16" round crown staples, galalloy coated for high rust resistance.*

LIST $15.

SAFE!
Can't damage wire because staples automatically stop at right height! Won't even break ¼" hollow glass tubing.

FAST!
Proved by test 6 times faster than old hammer method. Saves you 70% in fatigue and efficiency . . . saves many dollars a year.

HOLDS!
New staples get tremendous holding power from tack points that spread to lock themselves into wood!

Write for catalog and information.

ARROW FASTENER CO., INC.
ONE JUNIUS STREET, BROOKLYN 12, N. Y.

the speed at 3600 rpm. Another interesting feature, the company states, is that the unit is both fungus-proof and corrosion-proof.

The output is 350 watts, 115 volts, single-phase, 60-cycle of two-wire design. The input is 24 volts dc, 3 amps per terminal, 2 field amps.

Kato Engineering Co. developed one of the first rotary converters on the market in 1928 to meet the demand to operate ac radios from dc electric systems. Today more than 100 models are available with numerous dc input and ac output combinations. The smallest size manufactured is 350 watts while the largest is 2500 watts. Request NP769.

•

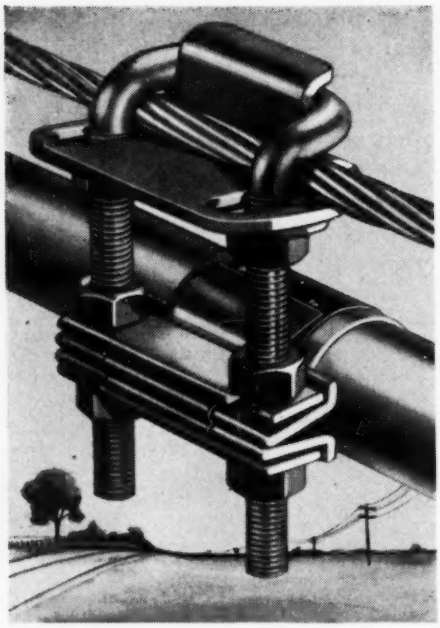
VERTICAL MOTOR-GENERATOR SET—Kato Engineering also has developed a vertical type motor-generator

set for use with control equipment. The set has an input frequency of 60 cycles per second and an output frequency of 360 cps.

The higher frequency, when placed on normal 60-cycle lines, will interrupt frequency selective circuits, enabling power equipment to be turned on or off remotely.

This machine operates at 1800 rpm. The motor and generator are on a common shaft. The single phase output of this 360-cycle unit is 500 watts.

The Kato company has recently developed a full line of frequency-changing motor-generator sets with generator frequencies as high as 1200 cycles per second. The 400-cycle line now extends to 250 kw, with small brushless induction-type 400-cycle motor-generator sets also available. Request NP770.



For Non-Slip Grip on Steep Grades depend on

KEARNEY
GRADE CLAMPS

To hold aerial cable on grades or corners, you can be sure of a permanent, non-slip grip when your crews use KEARNEY Grade Clamps. And with this tight grip there is absolutely no danger of damage to the cable. A wide steel band binds it to the clamp. You can re-use the clamp again and again, simply by inserting a new length of band. No matter what size of cable is used, the correct spacing between cable and messenger is always maintained. Double-length Grade Clamps are available for clamping two cables to a single strand.

For Better Construction . . . Safer Maintenance

Specify 267

KEARNEY PRODUCTS

4224-42 Clayton Ave. • St. Louis 10, Mo.
Canadian Plant: Guelph, Ontario

Stewart
TEST EQUIPMENT

Locates Trouble FAST

MODEL A—Locator-Tester
MODEL D-1—Midget Detecto-Meter
MODEL E—Exploring Coil Amplifier
MODEL G —Dual Electrolysis Voltmeter
MODEL H—Lineman's Test Set
MODEL J—Transistor Oscillator
MODEL L—Cable Tester

STEWART BROTHERS
Division of Instrument Laboratories
Chicago 10, Illinois

Here's Safer, Easier Reel Handling

●Here's the reel jack that is strong and stable without hard-to-handle extra weight. An aluminum alloy housing reduces overall weight by 21 pounds, yet maintains full 10-ton capacity. "T" shaped laminated oak base gives solid, safe foundation. Single acting mechanism provides easier operation. Handles reels to 84" dia.; weighs 83 lbs. Furnished with 5' lever bar.

Write for full data on Reel Jack No. A-1029 and other Simplex Utility Jacks.

Pole Pulling and Straightening Jacks—Save time, cut work crews necessary to pull, straighten or move poles. No. A-1538 has aluminum housing, 15-tons capacity, weighs 63 lbs.

All-Purpose Jack — No. 310A lifts, pulls, pushes at any angle. Four lift points. 15-tons capacity.

WORLD'S LARGEST MFGRS OF INDUSTRIAL MECHANICAL AND HYDRAULIC JACKS
SIMPLEX JACKS
RE-MO-TROL UTIL-A-TOOL JENNY ROL-TOS

TEMPLETON, KENLY & COMPANY
2557 Gardner Road, Broadview, Illinois

LOW-CAP ALPETH CABLE—General Cable Corp. has announced the availability of low-capacitance polyethylene-insulated Alpeth and DS-Alpeth sheathed cables in sizes 16-26-51-76-101-152 and 202 pairs—19 gauge.

In general, low-capacitance cables are required for toll circuits and others in which low attenuation values are of prime importance. For many years, toll quadded cables have been and still are being used for such circuits, particularly in view of the fact that phantom circuits were possible with this construction.

Of late, however, transmission at carrier frequencies has become widely employed, and the need for phantom circuits has dwindled to a lower level. Requirements for cables having excellent transmission characteristics and low capacitance, have continued to increase.

General Cable has expanded its line of telephone cables to include plastic-type low-cap cable. Brief details of this construction are as follows:

The individual conductors are insulated with color-coded high-molecular-weight polyethylene, and the cable core is sheathed with either an Alpeth sheath for aerial or duct installation or a DS-Alpeth sheath for direct earth burial or other installations where specification of a sheath more rugged than usual is indicated.

DS-Alpeth provides an inner sheath of high molecular weight polyethylene directly over the cable core, with the standard Alpeth sheath (aluminum sheath and outer jacket) applied overall.

The average mutual capacitance of this cable is 0.066 microfarads per mile, making the cable eminently suitable for toll lines and carrier frequency transmission, the company states.

high visibility—illuminated

The Tele-Booth Sign is designed for quick trouble-free installation *above* outdoor pay stations — UP where the increased range of visibility assures you that more people can *see* the sign—and, in turn, stop to "make the call."

Large white letters against a solid blue background (four square feet of sign surface on *each* side) are highly visible by day, brilliantly illuminated at night.

Tele-Booth Signs are built for the outdoors, sheathed in aluminum, faced on both sides with shatter-proof Plexiglas. Lettering and background are on the inside, will withstand extreme heat and cold. Will not fade, chip or peel.

Heavy gauge galvanized brackets, welded to a reinforced frame permits solid mounting by clamp to standard utility service entrance mast or adjustable lag-screw mounting to wooden pole or adjacent building.

The Tele-Booth Sign is manufactured to exacting standards by Ad-Pact Corporation, suppliers of outdoor signs for RCA, Socony-Mobil, Miller Brewing, Maytag, Swift and other industry leaders. Ask your local distributor, who has full details on this sign, to order in any quantity from Ad-Pact Corporation.

"PROVE-IT-YOURSELF-PLAN":

Want to field test Tele-Booth Sign profit possibilities in your own territory, without obligation? Call or write Jim Signorile, Ad-Pact Corporation, Dept. AP, 271 Madison Ave., New York 16, ORegon 9-1060.

*** Actual Tele-Booth Sign installations have shown increased revenue of 25% or more per booth.**

SPECIFICATIONS:

SIZE: 2' High 2' Wide 5½" Deep

CONSTRUCTION: Formed aluminum case, insect proof, vented, access section for lamp replacement. Plexiglas sign face (two sides) all lettering and color permanently applied inside.

ILLUMINATION: Interior, four 58-watt incandescent lamps. Available with or without flasher. Fluorescent illumination in slightly larger size sign available. Optional, extra.

PACKING: Individually packed in carrier-approved carton, complete with hanging bracket and lamps. Shipping weight, 25 pounds.

UNDERWRITER APPROVED — UNION-MADE

AD-PACT CORPORATION

271 Madison Avenue · New York 16 · ORegon 9-1060

XUM

TELE-MUFF Jr.

The Head Set Ear Cushion
Designed Especially for Switchboard Operators

Made of Soft Pliable Vinyl Foam

- Easy on Ear
- Inexpensive
- Attractive

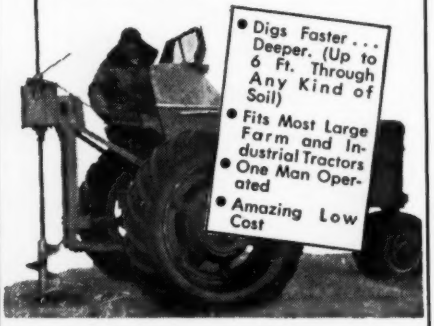
Write for Details

Thanks for your splendid response. All orders being shipped promptly.

TELE-MUFF CO.
Box 832
San Fernando, Calif.

NOW! A HEAVY-DUTY
INDUSTRIAL DIGGER
that is TRACTOR MOUNTED

Designed for RUGGED DIGGING
- Telephone Poles
- Footings
- Heavy Posts


• Digs Faster . . . Deeper. (Up to 6 Ft. Through Any Kind of Soil)
• Fits Most Large Farm and Industrial Tractors
• One Man Operated
• Amazing Low Cost

Prewitt's NEW INDUSTRIAL DIGGER allows one man to do the job it would ordinarily take a crew of men to do. P.T.O. driven, it utilizes full weight of rear of tractor to force auger into ground. Saves time and money!

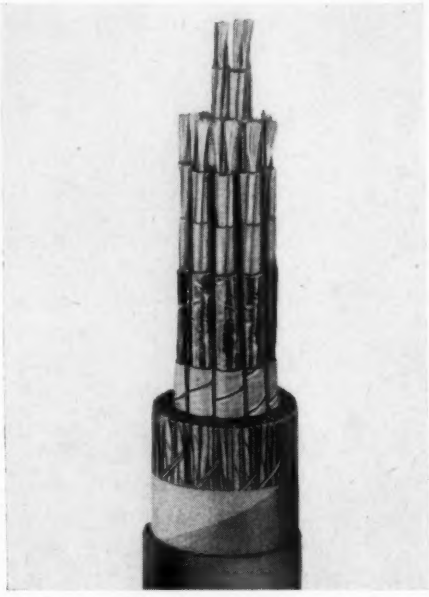
See Your Dealer or
WRITE FOR FREE LITERATURE
Dept. 304

J.R. PREWITT AND SONS
SINCE 1929
Pleasant Hill, Missouri
Phone 40

Specifications are available which give complete details on cable constructions, weights, diameters, electrical characteristics, etc. Request NP771.

•

VIDEO PAIRS — UNIVERSAL FREQUENCY — RANGE CABLE — General Cable also announces it is producing universal frequency—range cables covering a broad spectrum of communication bands.



These cables incorporate video pairs of new and improved design which provide balanced circuits for video and carrier, closed circuit TV or remote TV pickup, data transmission, microwave links, and other applications in the medium-frequency range.

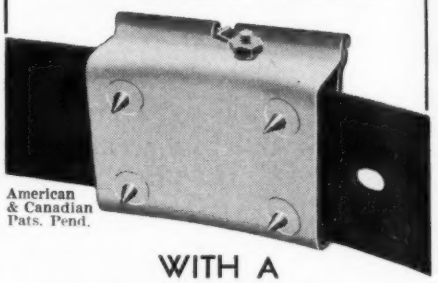
The improved video pair design provides two #16 gauge annealed copper conductors, each insulated with a wall of expanded (foam) polyethylene. The conductors are assembled with two fillers made up of foam polyethylene extruded over fiberglass cores.

The conductors and fillers are twisted into what is essentially a Spiral-Four assembly, bound with a helically-wrapped polyethylene tape and shielded by a longitudinally-folded copper tape with a helically-wrapped copper tape over-all. Further coverings are applied as required, depending on the type of cable to be made.

This video pair construction which is provided with excellent shielding, has low mutual capacitance, low capacitance unbalance, low internal echo and attenuation. A TV signal transmitted over such pairs will appear on the viewer's screen as a high quality picture, the company reports.

Video pairs may be combined with paper-insulated pairs, quads, pairs-and-quads or alone. Such cable cores may be furnished with lead, aluminum or

A SAFETY STRAP IS 100 TIMES SAFER



WITH A

SAFE-T-CLAW

Safe-T-Claw's life-saving grip can prevent the threat of crippling injuries and fatalities due to cut-outs and slipping safety belts. Usable with either double or single belts, Safe-T-Claw's heat-treated, scientifically-positioned, steel calks firmly grip the outer side of the roughest pole—regardless of angle or weather! Enables fast, easy changes in working position; prolongs the life of safety straps. Cadmium-plated, all-steel construction. Quickly and securely anchored to belt by rigid spring-plate, Safe-T-Claw slips out of way when not in use. Snap-on claw-guard included for tool-box storage. Write for full information.

Select Distributor Areas Still Available

P-C CORPORATION
Box 698, 138 Railroad Ave., Edmonds, Wash.

KEEP CUSTOMERS HAPPY

Porcelain Products insulated screw eyes are made to speed installation . . . provide your customers with continuous telephone service. They're put up . . . to stay up. Hotdip galvanized hooks and screws, plus high grade, glazed dry-process electrical porcelain are quality features offered in both split-ring or solid-ring insulated screw eyes. Write for complete information today!

- **PROVIDE CONTINUOUS SERVICE WITH PORCELAIN PRODUCTS TELEPHONE INSULATORS**

PORCELAIN PRODUCTS, INC.
Carey, Ohio

Stalpeth sheath, or armored for a variety of uses. Video pairs may also be incorporated into Alpeth or DS-Alpeth designs.

With the introduction of these cable constructions, General Cable makes possible the inclusion of voice, carrier and medium (up to 4.5-megacycle) frequency cable facilities under one sheath. Request NP772.

•

TEST EQUIPMENT WITH STROBOSCOPIC LIGHT—Northeast Electronics Corp. announces the addition to their line of test equipment, the model 1065 Tacholite.

The Tacholite provides a variable frequency stroboscopic light source for a study of objects in motion. The unit is calibrated from 10 to 100 pulses per second. For precision measurements an output is provided to drive a counter. Request NP773.

•

NYLON CLAMPS—Six new sizes of nylon clamps are announced by Holub Industries, Inc. They are .562 inch, .625, .687, .750, .875 and 1.0-inch I.D. sizes.

These clamps are precision-molded by the injection process from du Pont nylon FM-10001. They have a temperature range of 60° below zero to +250° F. and will not support combustion.

According to the manufacturer, these clamps are extremely strong and tough; and hold their shape even under severe stress. They are inert to fungicidal attack, easily withstand changes in atmospheric conditions and resist corrosion or sweating.

The manufacturer also states that they remain stable when exposed to mild acids, chemicals, oil, etc.; that they are non-toxic and have excellent abrasion resistance.

Because nylon is a pliable material, the clamps easily open to any diameter to slip over wires, cable, tubing, pipes, etc. Round edges prevent damage to insulation or other delicate surfaces.

Other Holub nylon clamps are available in seven sizes from .125 inch to .500 inch I.D. Request NP774.

•

CARRIER CURRENT EQUIPMENT—The Budelman Radio Corp. has announced the production of their latest improved telephone carrier current equipment, Type 16B.

Designed specifically to provide a low-cost rural telephone carrier expansion of five additional channels (50 new subscribers to an existing wire pair), the Type 16B utilizes thoroughly tested double side band AM circuits.

The company states that two important features of the equipment are its low cost and easy installation without test equipment. A complete channel (10 new subscribers) can be installed in as little as four hours on a "connect" and "operate" basis.

A complete channel of carrier consisting of both terminals (central office and subscriber) together with essential accessories, in many cases costs less than poles, wires, labor and supplies for open wire line construction, states the company.

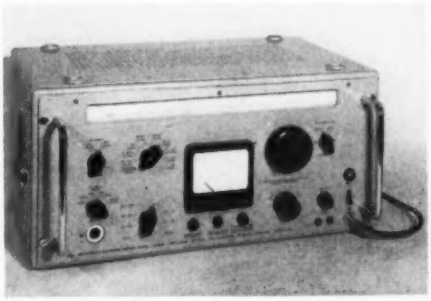
Without accessories, a complete Type 16B channel with selective ringing costs only $735.00.

Another point of interest to the Independent telephone company is that the Budelman Type 16B equipment has been type-approved by the Rural Electrification Administration for telephone company equipment financing.

Detailed specifications are available. Request NP775.

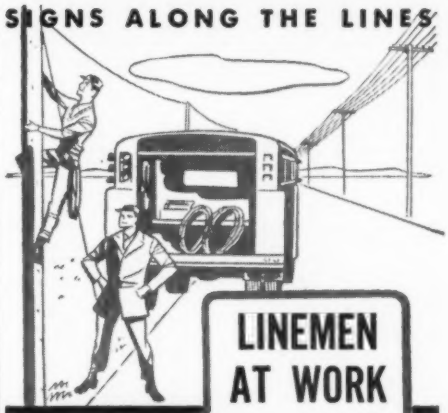
•

HIGHLY SELECTIVE MICROVOLTMETER—A highly selective microvoltmeter with great sensitivity and a frequency range of 20 kc to 30 mc has been introduced by the Industrial Products Division of International Telephone & Telegraph Corp.



The instrument (Type USVH) has a sensitivity of 1 microvolt to 1 volt, full scale, and a voltage level range of —120 to 0 db in sub ranges of 10 db, making it ideal for analyzing complex wave forms and taking voltage level readings, IT&T states.

SIGNS ALONG THE LINES



LINEMEN AT WORK

USING Crapo GALVANIZED GUY & MESSENGER STRAND

Positive strength and durability economies, combined with the superior qualities of steel, make Crapo Galvanized Steel Strand a rugged performer. The heavy, ductile, tightly-adherent galvanized coating — applied by the famous Crapo Process — provides dependable protection for the steel, prolongs the expectant life of the strand. There is a size and grade of Crapo Galvanized Strand for every practical need.

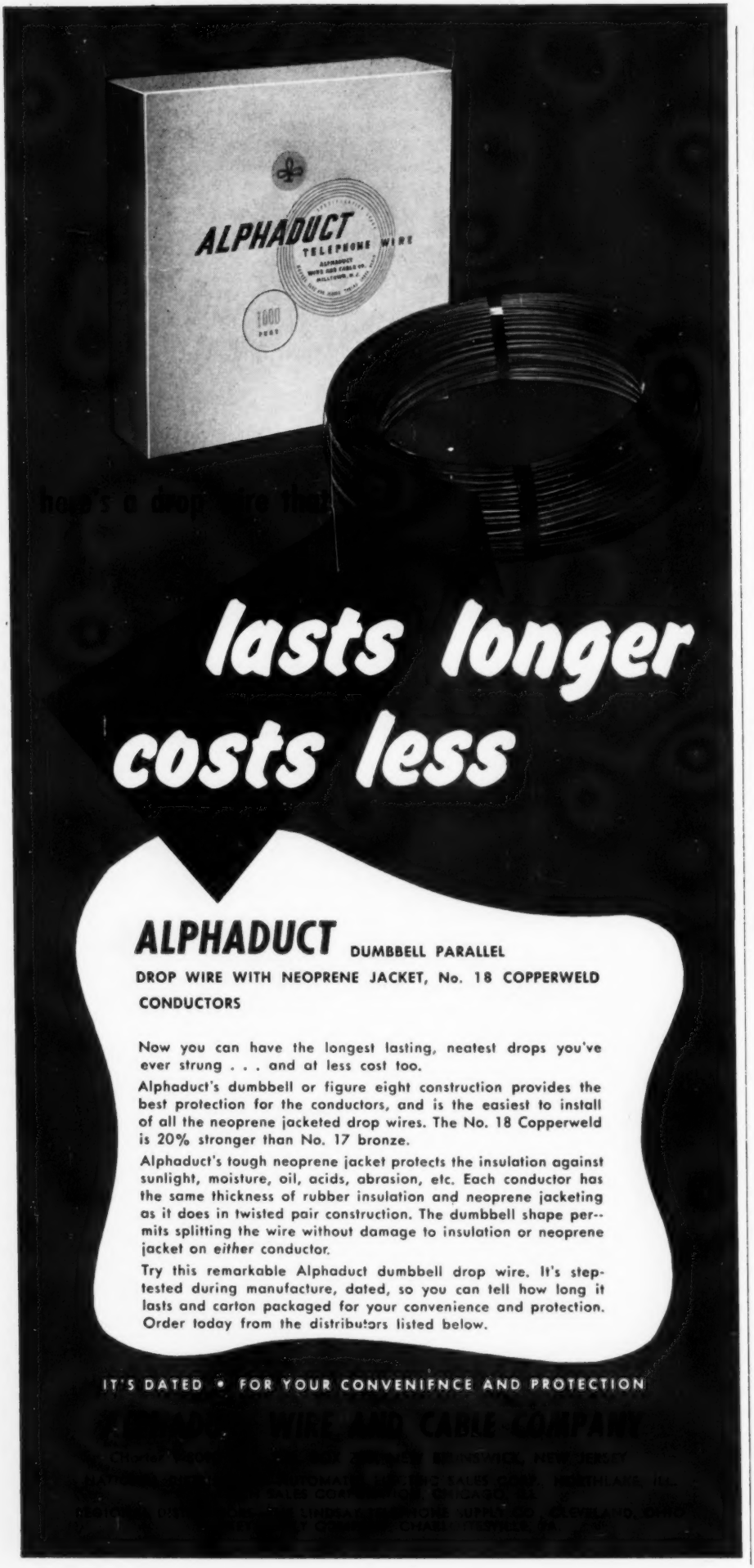
INDIANA
STEEL & WIRE COMPANY, INC.
Muncie, Indiana

NATCO
CLAY CONDUIT

The proved and standard protection for Underground Telephone Cables. Highest quality and full line of shapes.

NATCO CORPORATION
327 Fifth Avenue, Pittsburgh 22, Pa.

XUM


ALPHADUCT
TELEPHONE WIRE
1000
lasts longer
costs less
ALPHADUCT DUMBBELL PARALLEL
DROP WIRE WITH NEOPRENE JACKET, No. 18 COPPERWELD CONDUCTORS
Now you can have the longest lasting, neatest drops you've ever strung . . . and at less cost too.
Alphaduct's dumbbell or figure eight construction provides the best protection for the conductors, and is the easiest to install of all the neoprene jacketed drop wires. The No. 18 Copperweld is 20% stronger than No. 17 bronze.
Alphaduct's tough neoprene jacket protects the insulation against sunlight, moisture, oil, acids, abrasion, etc. Each conductor has the same thickness of rubber insulation and neoprene jacketing as it does in twisted pair construction. The dumbbell shape permits splitting the wire without damage to insulation or neoprene jacket on either conductor.
Try this remarkable Alphaduct dumbbell drop wire. It's step-tested during manufacture, dated, so you can tell how long it lasts and carton packaged for your convenience and protection. Order today from the distributors listed below.
IT'S DATED • FOR YOUR CONVENIFNCE AND PROTECTION

The instrument's frequency range is available in six sub ranges; 20 to 100 kc, 100 to 300 kc, 300 kc to 1 mc, 1 to 3 mc, 3 to 10 mc, and 10 to 30 mc. The meter has two bandwidths, 500 cps and 5 kc, the latter usable between 0.1 and 30 mc.

Other electrical and mechanical specifications are as follows:

Accuracy of Voltage Indication at 1 mc and 1 volt—±2 per cent.

Frequency Response Referred to 1 mc ±5 per cent.

Suppression of Image Frequency—Better than 60 db.

Noise Level—About 0.4 microvolts for 5 kc bandwidth and 0.1 microvolts for 500 cps bandwidth.

Input Impedance—Greater than 500 kilohms with 200 mmf in parallel.

Power Supply—100/125/150/220 volts 40 to 60 cps (80 v.a.).

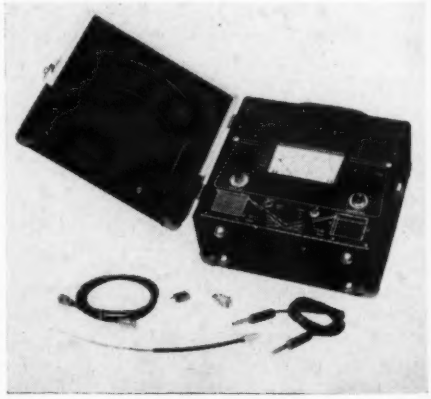
Dimensions—22½ inches x 10½ inches x 14¼ inches.

Weight—66 pounds.

Request NP776.

•

MULTI-PURPOSE TEST SET—Simplicity of use is featured by a new, multipurpose portable test set just announced by Motorola. A transistorized electronic ac voltmeter and a full-view, 4-inch, 2 per cent meter have been incorporated in the new test set.



Designed to facilitate the aligning and testing of all Motorola mobile and base station transmitters and receivers, the new test set also features function-grouped controls and calibrated meter scales.

By combining the functions of a number of instruments into one compact set, this new test set greatly reduces the time and equipment required to service two-way radio units on the bench or in the field. Its various uses include those of a voltmeter, milliammeter, RF power output indicator, relative field strength meter, signal generator and crystal checker.

In addition, it contains a built-in PM speaker for audio reception. The unit is very easy to use, the company says;

simply connect the test set to the radio set with the metering cable that is supplied and set the selector switch for the desired test reading.

Maximum reliability and minimum battery drain are assured by the use of long-life, trouble-free transistors. A transistorized audio frequency electronic voltmeter permits accurate measurement of ac voltages below two volts.

A transistorized IF oscillator circuit provides crystal-controlled IF frequencies between 280 kc and 13 mc. A 455 kc crystal is included to assure precise alignment of the last IF and discriminator stages. Additional crystals can be added as required.

In addition, this unit can be used to measure A+ and B+ in both receivers and transmitters, grid and plate current in the transmitter, relative field strength of radiated signals, transmitter power output and receiver quieting sensitivity.

A transistorized RF peaking generator, available as an optional accessory, provides crystal-controlled RF output for RF peaking of 25-54, 144-174, 450-470 and 890-960 mc receivers. Any one of eight internal crystals (also available as optional accessories) can be selected by means of a front panel control.

The Motorola Model TU546 portable test set is powered by four 1½ volt size "D" batteries. It measures 12½ x 12 x 6½ inches, and weighs 11 pounds. Request NP777.

•

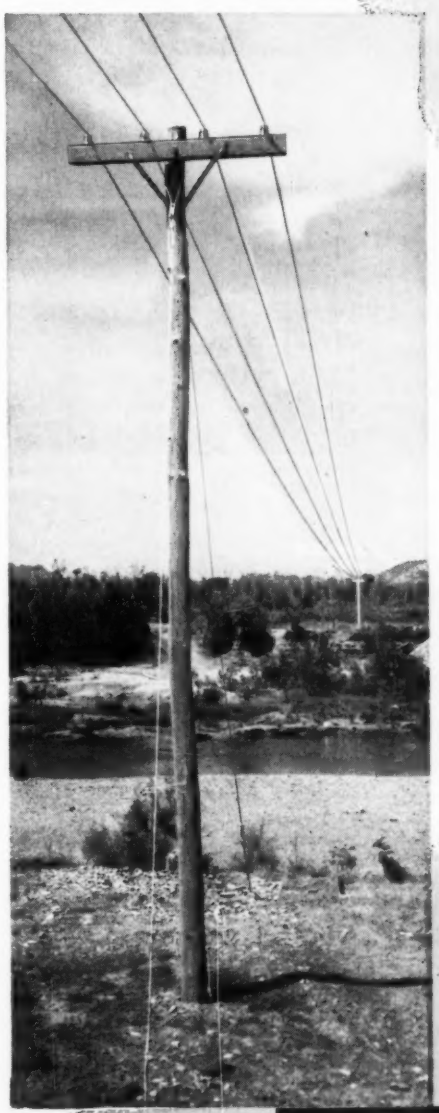
VERTICAL-BOOM, CRAWLER DITCHER—A new vertical-boom, crawler-mounted ditcher has just been announced by Barber-Greene Co. as an addition to their line of crawler and rubber-tire-mounted, vertical-boom, wheel and ladder ditchers.

A complete new design, the Model 784 embodies the basic chassis of Barber-Greene's Model 774 wheel-type ditcher which was announced early in 1957. If desired, the Model 784 vertical boom may be removed and the

Crapo HTL-195

FOR EXTRA LONG SPAN RURAL LINES

The *NEW* *LOWER* Resistance Extra-High Tensile Line Wire



- Better Voice Transmission
- Spans to 600 Feet or More
- Savings in Material and Labor
- Lower Ultimate Costs

Superior voice transmission qualities and extra high physical strength are combined in *Crapo* HTL-195 to provide the most practical and economical of conductors for rural telephone circuits.

This new, lower-resistance steel line wire, with a minimum breaking strength of 1800 pounds, makes possible spans to 600 feet in Heavy Loading, 650 feet in Medium Loading and 700 feet in Light Loading areas. Where terrain and other conditions permit the use of extra long spans, this means a 40% reduction in pole structures. The savings in materials and in construction costs will be apparent.

Before building new, or replacing old rural lines, investigate the possibilities of *Crapo* HTL-195! Write for complete information, including Manual of Engineering Data, No. A-195!

Pioneers in the development of high tensile and extra-high tensile steel line wire, and associated products, for the telephone industry.

INDIANA

STEEL & WIRE COMPANY, INC.
MUNCIE, INDIANA

XUM

DESIGNED WITH SAFETY IN MIND

36" swivel blade with 5 points per inch, tensioned by bent wood bow. Narrow blade reduces friction. Blade can be turned to three positions for cutting ease. Excellent for close crotch work.

Also available: insulated tree trimmers, hand saws, tree paint, safety saddles, tree bracing materials.

Write for Public Utilities Catalog

BARTLETT MFG. CO.
3051 East Grand Boulevard
Detroit 2, Mich.

SAVE TIME and MONEY!
WITH A
6" FIELD RANGE FINDER

. . . Widely used by 'Phone and Utility Companies

Speed erection and maintenance of Telephone and Utility lines with this 6" Field Range Finder. Measure line clearance, spacing and sag from the ground. Measure distances from 8 ft. to 100 ft. with accuracy to within 2%. Especially useful for inaccessible objects and places. These are sturdily built instruments . . . of such compact size they're easily carried in pocket. Dependable for years of trouble-free service in rugged use. Available in two models —Direct Vision and Overhead Prism. Each supplied with a top-grain genuine leather carrying case. Order by Stock Number (open account to rated firms).

Stock No. 50,137-DL Direct Vision Model. .$32.50
Stock No. 50,138-DL
Overhead Prism Model. $43.50

Write for FREE CATALOG—DL

World's largest variety of optical items—Microscopes, Binoculars, Telescopes, Infrared Sniperscopes, Satellite Scopes, Lenses, Prisms, Reticles, etc.

EDMUND SCIENTIFIC CO.
Barrington, New Jersey

5½-foot digging wheel of Barber-Greene's Model 774 wheel-type ditcher may be substituted.

The vertical digging boom offers a maximum digging depth of 7 feet and bucket widths of 19, 21 and 24 inches. This variation in digging widths is achieved with a single bucket line by varying the position or adding teeth to the individual buckets on the digging line.

The 784 also carries the application of Barber-Greene's "Hydra-Crowd" all hydraulic crowding speed transmission, which provides the ditcher operator with an infinitely variable range of forward crowding speeds from 0 to 31 ft. per minute and an instantaneously available reverse speed of 15 ft. per minute.

This infinite range of forward speeds is completely independent of the machine's three bucket line speeds which are controlled, or varied by the operator through another, mechanical, transmission. The infinite range of crowding and bucket line speed combinations aids the operator to meet all sorts of digging conditions, the company states.

A relief valve in the "Hydra-Crowd" mechanism, plus a rheostat-controlled electric-overload clutch, which can be varied in tension by the operator, to suit digging conditions, provide overload release for the machine and eliminate the need for mechanical slip clutches, breaker-bolts or similar relief devices.

The company says that hydraulic brakes are used through the crawler drive differential to provide smooth, quick-response steering by independently braking either crawler. The 8-foot reversible discharge conveyor is hydraulically driven in either direction at belt speeds which are infinitely variable from 250 to 630 ft. per minute. The boom hoist is likewise hydraulically controlled.

Through the elimination of long drive chains and substitution of flexible shaft and universal joint drives and by supporting the bucket line boom on pivoted arms which can be extended or retracted, it is possible, with the 784 to have a 5° variation to either side between the center-lines of the chassis and the digging boom. This simplifies the problem of digging on a curve and eliminates undue strain on the boom or chassis in such operations, reports the company.

Among the many optionals and accessories available for the 784 are two types of crawler assemblies, grousers for both types of crawlers and the substitution of Diesel power for the gasoline engine normally furnished. Request NP778.

MAGNOLIA GLAYZIT
Telephone Refinisher
POLISHES

Cleans, revitalizes, preserves the surface! Dustproof—polish can't come off on cloth when dusting. Only dust comes off! Restores cabinet-maker's finish to furniture! Adds years to life of any finished surface! Supreme for telephones.

MAGNOLIA CHEMICAL CO., INC.
CHICAGO • LAFAYETTE, INDIANA
ATLANTA • DALLAS • LOS ANGELES

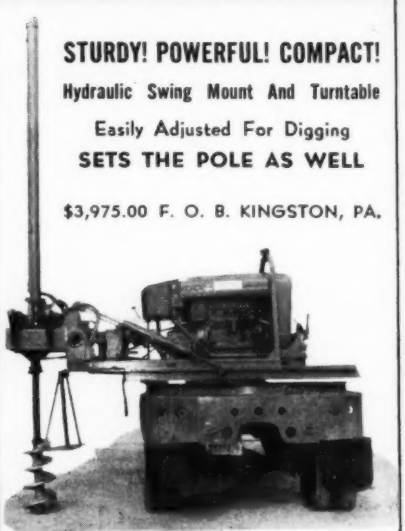
Distributed by

LEICH SALES CORP.
427 WEST RANDOLPH STREET
CHICAGO 6, ILL. • RAndolph 6-5441

STAKE YOUR CLAIM IN DIGGING PROFITS
WITH A
STERLING PROSPECTOR

STURDY! POWERFUL! COMPACT!
Hydraulic Swing Mount And Turntable
Easily Adjusted For Digging
SETS THE POLE AS WELL

$3,975.00 F. O. B. KINGSTON, PA.



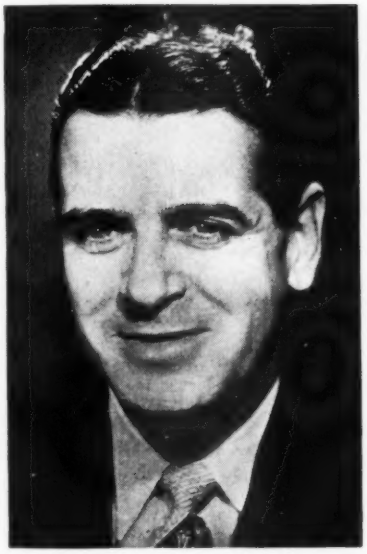
See the Sterling *"PROSPECTOR"*
Ask For A Demonstration

WYOMING VALLEY EQUIPMENT DIV.
714 WYOMING AVE., KINGSTON PA.

McCormick and Sullivan Appointed by General

C. E. McCormick, southwestern division manager of the General Telephone Co. of Indiana, assumed duties as

C. E. McCORMICK



R. P. SULLIVAN

president of the General Telephone Co. of Upstate New York, effective Dec. 1.

As president of the New York com-

Construction Crews Station Installers
Central Office Installations
Cable Splicers Complete Engineering

HENKELS & McCOY

6100 North 20th Street Philadelphia, Pa.

Now Operating in 30 States

OFFICES LOCATED AT

Elkhart, Indiana .....Tel. 2-5650
Ashland, Ohio .....Tel. 3-7543
St. John's, Michigan.....Tel. 966
Springfield, Illinois .....Tel. 4-7360
Erie, Pennsylvania .....Tel. 2-4300
Sumter, South Carolina.....Tel. HO-9-3332
Ocala, Florida .....Tel. MA-9-1284

PERFORMANCE Has Built Our Business

INSPECTION SERVICE AT TIMBER TREATING PLANTS

Of poles, crossarms, and preservative treatments. Analyses of wood preservatives. Consulting and specification writing.
Inspectors stationed throughout U.S.A.

A.W.WILLIAMS INSPECTION CO., INC.
MOBILE, ALABAMA

ORDER FROM L. E. S. AND PAY LESS

CABLE SPLICING TOOLS & SUPPLIES
PROMPT DELIVERY FROM STOCK
Send for Bargain Stock List No. CS.

LINE EQUIPMENT SALES
529 So. Dearborn St., Chicago 5, Ill.

TUDOR AND YAGER, INC.

Telephone Construction

TIPTON, INDIANA
Phone OSborne 5-2267

YATES CONSTRUCTION CO.

"Specializing in Telephone Construction"

Cable Splicers, Telephone Installers, Equipment Installers, Construction crews.

1507 SOUTH SIXTH ST. PADUCAH, KY.
TELEPHONE 2-4623

KILLOREN COMPANY

Construction crews—Installers
Cable Splicers
30 years experience

136 N. State St. Appleton, Wisconsin
REgent 3-5549

CABLE SPLICERS • LINEMEN STATION INSTALLERS

STEADY WORK, GOOD PAY
MIDWEST LOCATION.

The Weikel Line Company, Inc.
FORT WAYNE, IND.

TELEPHONE PRINTING

By People Who Know the Telephone Business
SEE THE SUTTLE CATALOG

SUTTLE EQUIPMENT CO.

LAWRENCEVILLE ILLINOIS

HARRIS-McBURNEY CO.

PUBLIC UTILITY CONSTRUCTION

A complete construction service for the telephone industry

Construction Crews Engineering
Station Installers Appraisals & Reports
Cable Splicers C. O. Installation

Underground Duct Systems

Telephone ST 4-6126

P. O. Box 267 Jackson, Michigan

CABANISS-POGUE COMPANY

Consulting Engineers

Appraisals—Cost and Rate Studies
Financial Assistance

GRANT BLDG., ATLANTA, GEORGIA

CARL C. CRANE, INC.

Consulting Engineers

2702 Monroe Street, Madison 5, Wis.
Telephone CEdar 3-4210

ENGINEERING ASSOCIATES, INC.

Consulting Engineers

79 W. PEACHTREE PLACE, N. W.
ATLANTA, GEORGIA
TELEPHONE: JAckson 3-5925

McGRATH ENGINEERING, INC.

Consulting Engineers

209 West 6th Street
TOPEKA, KANSAS
Telephone CE 2-2358

SLOAN, COOK & LOWE

CONSULTING ENGINEERS

Appraisals—Original Cost Studies
Plant, Traffic and Commercial Engineering

120 S. La Salle St.
Chicago 3, Ill. Tel: FRanklin 2-5924

FOR ALL OF YOUR CENTRAL OFFICE AND PBX INSTALLATIONS, MODIFICATIONS, AND ENLARGEMENTS, IT'S THE

T. E. I.

TELEPHONE ELECTRONICS INSTALLATION CORP.
Hayes Bldg., 12 E. Tenth St., Erie, Pa.
CAN WE BE OF SERVICE TO YOU?

ROBERT E. FOLEY CONSTRUCTION CORP.

DESIGN—SURVEYS—APPRAISALS—Construction and Maintenance of Overhead and Underground Telephone Plant. Complete supply of poles available for emergency requirements.

48 GRISWOLD STREET
BINGHAMTON, N. Y. TEL. 2-7215

Complete outside telephone plant builders. From frame to the phone

MULLEN CONSTRUCTION COMPANY

2002 E. Wisconsin Ave. REgent 4-9881
Appleton, Wisconsin

pany, Mr. McCormick will make his headquarters in Johnstown. He succeeds R. Parker Sullivan, who recently became vice president-merchandising of General Telephone Corp. of New York City.

McCormick has made his headquarters in Terre Haute since January, shortly after the merger of the Citizens Independent Telephone Co. with General. The southwestern division includes the areas served by the Terre Haute, Greencastle and Morton exchanges.

Prior to the merger, he had served as general manager and, since 1946, a director and vice president of the Citizens company.

A native of Fort Wayne, Mr. McCormick attended grammar and high school there and Purdue University. In Fort Wayne he was employed as commercial manager of the Home Telephone & Telegraph Co., which also was merged with General this past year.

Mr. McCormick has been director of the Indiana Telephone Association for more than 10 years and is a past president of the organization.

Purposeful Endurance

"Still achieving, still pursuing, learn to labor and to wait."—LONGFELLOW.

Name Assistant Director Of BDSA Communications

The appointment of William J. Kleinknecht, general superintendent of the American District Telegraph Co., New York City, N. Y., as assistant director of the Communications Division of the Business & Defense Service Administration, U. S. Department of Commerce, was announced on Nov. 12 by BDSA Administrator H. B. McCoy.

In accepting this appointment, Mr. Kleinknecht brings to his new post current expert knowledge of the central station protective signaling industry. He is on loan to the BDSA from his company and will serve without compensation from the government.

Born in New York City on Jan. 16, 1894, Mr. Kleinknecht received his early education in the public schools in New York, and later attended the Pratt Institute in Brooklyn, N. Y. He served in the Armed Forces during World War I.

Mr. Kleinknecht entered the employ of the American District Telegraph Co. in 1920 and has spent his lifetime in this industry, having practical experience in all phases of manufacturing, purchasing, warehousing, and shipping.

He developed a rapid transmission system for the New York Stock Exchange to speed up transmission of stock quotations. Also he has been credited with many patents used with electric protective systems. He has served as executive committeeman on the National Metals Trade Association, and is a member of the National Fire Protection Association.

Stromberg Names McKinnon Pagemaster Sales Engineer

Raymond J. McKinnon has been appointed Pagemaster sales engineer for the telecommunication division of Stromberg-Carlson, covering the Western United States, according to an announcement by F. Leo Granger, Pagemaster sales manager. Stromberg-Carlson is a division of General Dynamics Corp.

In his new position Mr. McKinnon will work closely with distributors of Pagemaster, selective radio-paging system, in California, Oregon, Washington, Montana, Idaho, Nevada, Arizona, New Mexico, Utah, Colorado, and Wyoming, with headquarters in Sacramento, Cal.

Prior to joining Stromberg-Carlson, Mr. McKinnon had been commercial

LOOK TO THE LEADER...

for
- RELIABILITY
- SERVICE
- NATIONALLY KNOWN TELEPHONE SUPPLIES

Prompt delivery of your order as specified is assured by Lindsay's fast, efficient, personalized service. Lindsay specializes in telephone supplies *only* . . . warehousing a complete line of the finest nationally known brands . . . your guarantee of the best as you want it . . . when you want it.

LOOK TO LINDSAY

THE LINDSAY TELEPHONE SUPPLY CO., *Est. 1939*
10409 Meech Ave., Cleveland 5, Ohio • Telephone Diamond 1-9212

R. J. McKINNON

salesman for the Minneapolis-Honeywell Regulator Co. since 1952. Previously he was with United Air Lines, Inc., as an electronics technician at their maintenance plant in South San Francisco.

Mr. McKinnon served in the U. S. Navy as a radio technician from June, 1941 to October, 1945. In that time he served in the United States and the South Pacific and was promoted from apprentice seaman to chief radio technician. He is a member of the Naval Reserve, in which he was commissioned a lieutenant (j.g.) in 1949, and promoted to full lieutenant in 1951. He served with reserve Fleet Aircraft Service Squadron 875 at the Naval Air Station, Oakland, Cal.

A native of San Pedro, Cal., Mr. McKinnon received his early education there and in Los Angeles. He majored in liberal arts at Los Angeles College, and later attended the University of San Francisco where he majored in business administration.

Mr. McKinnon is an associate member of the Institute of Radio Engineers, and a member of the American Society of Heating and Air Conditioning Engineers.

E. W. Miller to Direct New Lorain Chicago Office

C. P. Stocker, president of Lorain Products Corp., Lorain, O., has announced the opening of a new Chicago area office to serve telephone operating companies and distributors of Lorain Products in that area and the territory west of Chicago.

The office is located at 9500 W. Ogden Ave., Brookfield, Ill., and is under the direction of Eldon W. Miller, sales engineer of the Lorain company.

Rock-bottom maintenance costs—the aim of every on-the-ball plant executive—come when you buy the drop wire that stays up, year after year, storm after storm.

[redacted]

Ask your own Kellogg man for the whole story. He will be glad to furnish you an interesting box of samples.

DISTRIBUTED BY:

KELLOGG SWITCHBOARD & SUPPLY CO.
CHICAGO, ILLINOIS

GENERAL INSULATED WIRE WORKS, INC.
PROVIDENCE 5, RHODE ISLAND

CLASSIFIED SECTION

Rates 15 cents per word payable in advance. Minimum charge $3.00 for 20 words or less. Classified advertisements must reach us 8 days before publication date.

POSITION WANTED

15 YEARS TOP RATED EXPERIENCE in installation and testing of all types C.O. equipment. Desire plant maintenance position. Further details write Box No. 4046, c/o TELEPHONY.

MR. EMPLOYER OF TELEPHONE TECHNICAL TALENT — Write for your sample copy of TELEPHONE TECHNIPOWER, a monthly bulletin for employers listing experienced telephone engineers, construction supervisors and managers who wish to relocate. WILLIAM J. McILVANE AND ASSOCIATES, 725—15th St., N.W., Washington 5, D. C.

LET ME TAKE THE LOAD FROM YOUR SHOULDERS . . .

Somewhere in the Western States there is an operating telephone company of 10,000 lines or less that can make good use of an alert and enthusiastic young manager or assistant with a varied telephone background and a keen desire to tackle a challenging job in an expanding territory.

- **32 years old**
- **Electrical engineering background**
- **Experience in Manual, Magneto, SxS, Automatic Toll Ticket, Carrier**
- **Telephone equipment sales**
- **Public Relations Training**
- **Available February 1**

An inquiry on your letterhead will bring complete details. Kindly address:

William Cannady
427 N. Alhambra Avenue
Monterey Park, California
ATlantic 1-7906

HELP WANTED

EXPERIENCED TELEPHONE ACCOUNTANT for class "A" company of 37,000 stations located in central Florida. Give résumé of experience and requirements. Write Box No. 4041, c/o TELEPHONY.

EXPERIENCED SWITCHMEN qualified in dial equipment maintenance for large progressive company in North and Northwest Florida. Position also open for experienced equipment installer. Good opportunity for right people. Reply, Attention: C.O.E. Engineer, P.O. Box 1080, Tallahassee, Fla.

HELP WANTED

WANTED: Telephone Installers, Cable Splicers, Linemen, Central Office Installers. Yates Construction Company, 1507 South 6th St., Paducah, Kentucky. Telephone 2-4623.

CABLE SPLICERS, Station Installers, Equipment Installers, Linemen. Experienced men needed. Steady work, good pay. Henkels & McCoy, 1211 Kenmore Avenue, Elkhart, Indiana, or 6100 N. 20th St., Philadelphia, Pa.

RESIDENT ENGINEERS AND STAKERS for telephone work in midwest. Must know staking and construction. Write Box No. 4045, c/o TELEPHONY.

MANAGER FOR MIDWEST TELEPHONE company of 3,000 stations. Excellent opportunity for good organizer. Must know accounting, commercial, and plant. Prefer man about 40. Write Box No. 4044, c/o TELEPHONY.

COMBINATION MAN, capable of managing dial plant of 270 stations located in West Virginia. State reference and expected salary. Write Hardy Telephone Co., Mathias, West Va.

JOURNEYMAN SWITCHMAN openings now available with opportunity for training and advancement into microwave. Also need equipment installers. Write Equipment Supervisor, Box 705, Fort Walton Beach, Fla.

PLANT ENGINEERS for large Independent Telephone Company. Some experience necessary. In reply state age, educational and employment history. Address reply to Personnel Supervisor, Rochester Telephone Corporation, 10 Franklin Street, Rochester 4, N. Y.

WANTED TO BUY

LEICH 901s. We buy, we sell Leich 901s. Write for current market prices. Telephone Co., Turtle Lake, Wisconsin.

TELEPHONES—all types—any condition; candlesticks, wall sets, etc. Write advising quantities available. Our truck will pick up. Reply to Box No. 3952, c/o TELEPHONY.

MANUAL CORDLESS MONITOR BOARD—5 trunks, 20 extensions. State price and condition. National Telephone & Signal Corp., 10 East 23rd St., New York 10, N. Y.

TELEPHONE EXCHANGE IN SOUTHWEST. Write Box No. 4043, c/o TELEPHONY.

WANTED TO BUY

OLD WALL TELEPHONES, must be complete. Write stating amount and location. Gene Thomas, Batavia, Iowa.

Am interested in buying operating company with more than 1000 telephones and good growth possibilities. Write Box No. 4014, c/o TELEPHONY.

FOR SALE

KELLOGG 6-800 SEVEN POSITION SWITCHBOARD. All positions Universal. 40 RD toll lines, 70 dial terminations. For information contact COACHELLA VALLEY TELEPHONE CO., Indio, Calif., EXpress 9-5678.

RINGING MACHINES-QD-15, D.C. Volts 44-52, secondary 65-90 volts—speed 1020-R.P.M. Like new $95.00. National Telephone & Signal Corp., 10 East 23rd St., New York 10, N. Y.

500 LINE A.E. CO. PAX complete, 20 per cent trunking, connectors last party release, reverse supervision, fine condition. Price $3000.00. Sell part. Type 40 telephones with dial, like new $15.00. National Telephone & Signal Corp., 10 East 23rd St., New York 10, N. Y.

RECLAIMED
SLIGHTLY USED WIRE
DISTRIBUTION, 6-pair, heavy support wire (color coded) No. 19 Copper, 300 or more feet per run. Few splices per coil—7 cents per foot.
NEOPRENE DROP WIRE, parallel, Copperweld, 90 or more feet per run—$11.00 per M. feet.
F.O.B. CHICAGO, ILL.
Independent Telephone Repair Co.
2137 West 21st St. LAfayette 3-5439

REBUILT TELEPHONE SETS
KELLOGG No. 1100—Wall, 1000 Ohm Ringers $12.00
KELLOGG No. 900 — Desk Straight Line Ringers $9.00
LEICH No. 600—Wall or Desk. Manual —$12.00 (with A.E. Dial)—$15.00
Hand Units, 3 cond. capsule type Rec. and Trans. .....$3.25 each
Calculagraphs, Model 33.....$35.00
Quotations are FOB Chicago, Ill.
Independent Telephone Repair Co.
2137 West 21st St., Chicago 8, Ill.
Tel.: LAfayette 3-5439

SOMETHING DIFFERENT FOR CHRISTMAS GIVING

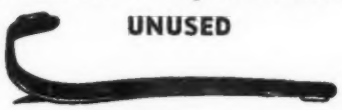
Bantam colored telephone, weighted, with top quality ball point pen trimmed in gold. Telephones in ivory, sand beige, yellow, red, green, light blue, light gray, pink, white. Pens in ivory, black, red, pink. Only $3.25 ea. postpaid. Send check or money order to W. H. Parker, 2741 Ridgeview Dr., San Diego 5, Calif.

This product is locally available in many cities from Junior Achievement Companies. Consult your directory.

"Building through Business for a Better America. Support Junior Achievement."

"SURPLUS" LINEMEN'S EQUIPMENT

UNUSED



Pole Climbers, Bare
Sizes 16" and 16½" only $2.95 Pair

Klein Splicing Clamp #132-15
$2.95 Each

F.O.B. San Francisco, Calif.

WESTERN HARDWARE & TOOL CO.
122—10th Street
San Francisco, Calif.

IN STOCK

CABLE: Rural Distribution, Plastic Jacketed Aerial or Duct Cable, Rural "C" Wire, Inside Wiring Cable, Etc. ALL SIZES—ANY LENGTH—IMMEDIATELY AVAILABLE!

CALL FOR YOUR PRICE!

TELEPHONES: Stromberg-Carlson #1248 (Desk) & #1258 (Wall) Self-Contained MAGNETO Telephones.....$19.50 Each
Stromberg-Carlson #1243-A Desk Handset Telephone, Dial Blanked for C.B.....$13.00 Each
Automatic Electric #40 Monophone, Complete and Dial Blanked for C.B.....$13.00 Each
WITH A.E. #24 Dial.....$17.50 Each

ALL TELEPHONES FULLY RECONDITIONED LIKE NEW WITH NEW CORDS and GUARANTEED

D1A FIELD WIRE: All NEW Signal Corps Telephone Wire. 4 Copper 3 Steel Strands Each Conductor. Plastic & Tough Nylon Jacketed-TWISTED PAIR. For Emergency, Drop, Station, Etc.
On 1 Mile Reels @.....$32.50/Mile DELIVERED!

QUANTITY DISCOUNTS AVAILABLE!

Many Other New or Reconditioned Supplies & Equipment, Neoprene Drop Wire, Other Makes of Telephones Also In Stock.

TELE-WIRE SUPPLY COMPANY, INC.

146 Front Street Call HAnover 2-9690 New York 5, N. Y.

POLES

B. J. Carney & Co., 100 N. 7th St., Minneapolis, Minn.—Western red cedar poles. Pentrex Butt Treated or Plain.

Cascade Pole Co., P.O. Box 743, Tacoma, Wash. — Creosoted Douglas Fir and Cedar Poles.

C. M. Christiansen Co.—Northern White Cedar Poles, Pentachlorophenol treated. Plant and Yards, Phelps, Wis.

Dierks Forests, Inc. (formerly Dierks Lumber & Coal Co.) Wood Preserving Division, 810 Whittington Ave., Hot Springs, Arkansas. Southern Pine select poles, all sizes and lengths, creosote and penta-pressure treated. Prompt shipment.

Eppinger & Russell Co., 80—8th Avenue, New York 11, N. Y.—Creosoted Poles and Cross Arms. Plants: Jacksonville, Fla., Norfolk, Va., Eddington, Pa.

International Creosoting and Construction Co., Galveston, Texas.—Creosoted Southern Yellow Pine Poles. Plants Beaumont and Texarkana, Texas.

International Paper Co., Long Bell Division, 926 Grand Ave., Kansas City, Mo. —Pressure-treated Southern Pine and Douglas Fir Poles. Creosote and Penta preservatives.

Montana Pole & Treating Plant—Box 2004, Butte, Montana. Penta-Pressure treated Lodgepole Pine and Western Larch Poles. Inquiries invited.

Texas Creosoting Company—512 Main Street, Orange, Texas—Creosoted Southern Yellow Pine and Douglas Fir Poles. Can also treat with "Penta."

ATLANTIC

Creosoting Co., Inc., 17 Battery Pl., N. Y. C.

Creosoted Pine Poles • Crossarms

PLANTS AND OFFICES

Boston, Mass. Portsmouth, Va.
New York, N. Y. Philadelphia, Pa.
Savannah, Ga.

L. D. McFARLAND COMPANY

Box 390 • Sandpoint, Idaho

WESTERN RED CEDAR, DOUGLAS FIR, WESTERN LARCH AND LODGEPOLE PINE. CREOSOTE AND PENTA BUTT OR FULL-LENGTH TREATED POLES.

EMPIRE

—3-wire & 7-wire Strand
—Stainless & Galvanized Lashing Wire
—Pole Line Hardware
—Specialties for the Communications Industry

EMPIRE STEEL & WIRE CORPORATION
1506 Wesley Ave., Erie, Pa. Phone 86-542

SPECIFY TELERING for

Dependable and Economical Telephone Ringing Power Equipment.
Engineered for complete satisfaction.

Manufactured by

TELKOR, INC. Elyria, Ohio

What You Want When You Want It

immediate Shipment from Nearest Warehouse Points

TELEPHONE & POWER SUPPLY, INC.
TOPEKA, KANSAS PHONE 4-8788

XUM

YEAR END SALE . . . Order Now For 1958 Billing

Manual Switchboards, CB-LB-PBX

—hundreds in stock—

priced "as removed from service"

—reconditioned or rebuilt—

Some never used, others in use only a year or so in military establishments.

W.E.

550, 80 line, with relays . . . . . $500.

551A, 40 line; like new . . . . . $400.

506, 3x7, reconditioned . . . . . $125.

506B, 5x12, reconditioned . . . . $150.

605, 3 positions, 15 cd. ckts., 1 position with 50 CB trunks—equipped as desired.

Kellogg

K-100 PBX, 100 line relays
unused, clean . . . . . $750.
slightly used, reconditioned . . $500.

Universal CB, wired & equipped 15 CB cd. ckts., 100 lines (relays), 10 lamp ended RD trunks, dial cd., like new, low type, space for 200 lines, mahog. cabinet . . . . . $750.

3 position & turning pos. New 800-1200 line cap., less line jacks & lamps —one unit—height 73"—oak finish $1,000.

3 positions (separate) 800 line capacity, less line equipment $200. ea. #269 jack strips, num. 0-9, new . . $5.

Cordless, magneto, lamp, 24 volt, ideal for mag. PBX or toll, etc., BD 105, 12 line, 5 conn. links, new . . $95.

BD 95, 20 line, 5 conn. links, new $150.

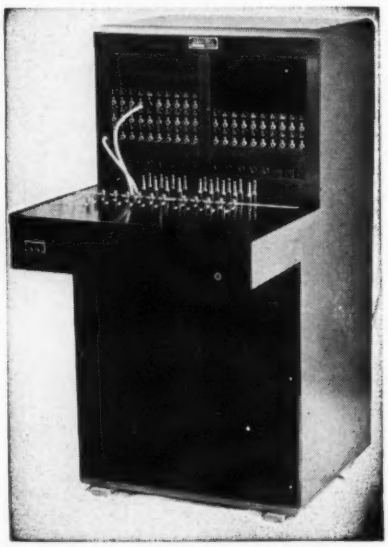
Stromberg-Carlson

#106 PBX, 100 line (relays)
new, A-1 . . . . . $650.
slightly used, reconditioned . . 500.
slightly used, checked out . . . 395.

Super Service CB, 3 positions, 400 line equipped, lamps & jacks, line & cut-off relays on rack as removed from service . . . . . $1,000.

PBX—2000 line cap. 3 pos. less line & lamp equip. (some available) height 73", 15 cd. ckts. . . . . $200. ea.

Universal, 1 pos. 150 line wired equipped 100 line (relays) 15 cd. ckts. (3 keys per cord for thru dialing —like new, little used . . . . . $350.



Kellogg (actual photo)

Hundreds Sold — Only 12 Left

MAGNETO EQUIPMENT

Kellogg & Stromberg Carlson

←(photo to left)

New 100 line—50 equipped with combined drops & jacks, wired to 15' 51 pr. braid cable stub—Night alarm ckt. (no code alarm) 10 cord circuits (single supervised) with repeating coils. Standard-low type, 30" cord-shelf (desk height) built for Navy—never used—Hardwood (birch or maple) cabinet, painted green.

Clean as a whistle—tested—
fully guaranteed $295
Prints on request.
PBX Boards, W.E., Kellogg, S.C.

Special Purpose Switchboards

Kellogg—Fire Reporting

New 40 line equipped, wired 100 balanced line type (2 lamps for each line, 1 for alarm, 1 for ckt. trouble) 48 volt (1 only) . . . . . $750.

Kellogg—Fire Reporting

Turrets, 20 line, cordless, good used.

W.E. Train Dispatching

Cordless, 40 line (20 each on 2 sloping key panels) cord ckt. for each line. Line relays & cd. ckt. equip. on 6', 19" rack nearly new . . . . . $650.

Many other lever & push key units for order boards, etc.

Telephone Answering Service Boards

Single & multiple positions.

W.E. Intercepter Boards

2 pos. same size as 55-1B. write—

A.E. PBX

3 positions, less line equipment (some available).

Portable Military Switchboards

BD 71, 72 91, 96-97, magneto.
BD 110, 89, X66070, Universal.

Switchboard Supplies, new

Relays, line & cut-off, etc., Kellogg, W.E., A.E., Stromberg-Carlson, North, Clare—100,000 in stock.

Cords, plugs, jacks, lamps, etc.

W.E. #141 on 112 mtg. sl. used . . $5.

W.E. #12 on 137 mtg., with lamps and caps, good used . . . . . $5.

BATTERY CHARGERS

Rectichargers:

24 Volt, 3 amp. . . . . $100.

24 Volt, 6 amp. . . . . $195.

48 Volt, 3 amp. . . . . $195.

G.E. copper oxide:

24 volt, 3 amp. adj. . . . . $50.

As above, in metal cabinet with 7.5 watt Sub-cycle, fuse-panel, battery shelves . . . . . $100.

G.E. tungar tube type:

12-85 volt adj. to 12 amp. . . . . $75.

Filter-reactor for above . . . . . $15.

Battery Eliminators:

A.E. 24 volt, 3 amp. tungar . . . . $75.

Lorain, 48 volt, 2 amp. Selinium . $95.

W.E. for key systems, intercom, etc. has both filtered & nonfil. taps . $20.

12 volt, Selinium, filtered, 1 amp . $25.

Subcycle, Lorain:

M 7.5 watt . . . . . $25.

Heavy duty 7.5, military type . . $35.

Model S, 15-20 watt, new . . . . . $50.
good, used . . . . . $40.

Model B, 20 watt (Bell Spec.) . $50.

Telering (vibrating reed) . . . . . $15.

Photos and further details on request

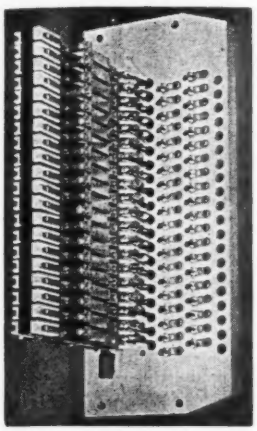
Telectric Co.

1218 VENICE BOULEVARD **Richmond 8-2249**

Los Angeles 6, Calif.

YEAR END SALE . . . Order Now For 1958 Billing

Western Electric



1435 W

Protectors MDF:

W.E. #1435W, complete, new ..... $15.
#1268A, complete, good, used ..... $10.
#1269A, complete, good, used ..... $10.
New ..... $15.
#C-50A, complete, good, used ..... $37.
#C-52A, complete, good, used ..... $39.
Cook #100 (20 pr) complete, good new ..... $15.
Cook #100 (23 pr) complete, new ..... $15.
Terminal blocks, 3c Terminal, most types.

Protectors, Substation

W.E. #98A, complete, new (interior) ..... $1.
Fuses for above #11C, 7 Amp. new 10c
per one hundred ..... $9.
W.E. 83A, open wire, W.P. complete ..... $5.

Loading Coils: 88MH, for loading field wire

At 1 mile intervals. Potted in waterproof plastic case with hole-thru type screw terminals, C-114A, W.E. 632 coil $2.00

Coils only, for repotting 88MH, W.E. 632 coil $2.00

Terminals: Cable, (lead stub)

W.E. BD 102, 202, 606, E-26, E-51, F-26, G-16, G-26, H-51, LA-26, LB-26, LC-26, LA-51

Cook Uniflex, Transmount, Vault, X, etc.

Reliable RUG, 11 pair.

Cable:

Lead, Neoprene, Plastic types; also braid, lead & plastic swbd. types.

COPPERWELD LINE WIRE, #12 (.080") 40% cond.

new factory coils (average 100 lbs.)

A-1 export wrapped ..... 37c lb.

slightly tarnished ..... 32c lb.

quantity discounts

PLAN TO CONVERT
Magneto to Dial

Start now by using CB phones in town —one of these coils connected to each drop, thru condenser to common battery will provide CB service on that line.

Subscriber signals operator by lifting handset and rings off by restoring it.

KELLOGG

C-111

New $2.50

Used—A-1 ... $1.50

Mounting—10 coil for 19" rack ... $2.50

Repeating Coils:

(Over 10,000 in stock)

W.E. 77A (equivalent), rack mtg. ..... $ 3.00
77A (equivalent), 5 screw terminals on phenolic base, C-161 $ 3.75
76A (2), 77A on wd. base ..... $ 6.00
75A same as 76A, matched for rep. ... $ 7.50
galv. housing for 76A, 77A ..... $ 2.50
#84A prot. for use in above ..... $ 2.75
27A, non-ring-thru for cord ckt. ..... $ 3.00
25A, 2 #27A on wd. mtg. $ 5.00
94E non-ring-thru ..... $ 2.00
91A 2 coils on steel mtg. $10.00
93A as above, better matched, B, F, G ... $12.50
101A ..... $ 4.00
70A large ring-thru, wd. base ..... $ 5.00
Kellogg #19A ring-thru ..... $ 3.50
A.E. #4A—D181596AZ ..... $ 3.00
(Many others W.E., A.E., SC types in stock)

Test Equipment

EE 8 Army Field Telephones

New ..... $30.
rebuilt like new ..... 25.
reconditioned ..... 20.

EE 65 Wire Chief's Test Set

New, with manual ..... $25.
used, A-1, with manual ..... 15.

Transmission Measuring Set

I 61, battery operated ..... $100.
good used, A-1 ..... 75.

Wheatstone Bridge (slide wire)

TS 27 TSM, new ..... $100.
good used ..... 75.

—Parts for Older Phones—All New & Perfect—Priced to Clear—

All Prices F.O.B. Los Angeles

Shipped on Approval—Satisfaction guaranteed

Let us quote on your every need from our huge stock

Telectric Co.

1218 VENICE BOULEVARD **RIchmond 8-2249**

Los Angeles 6, Calif.

XUM

Index to ADVERTISERS

	Page
Acme Visible Records, Inc.	27
Ad-Pact Corporation	101
Alphaduct Wire & Cable Co., The	104
Aluminum Company of America	—
American Chain & Cable Co., Inc. Page Steel & Wire Div.	97
Wright Hoist Div.	—
American Creosoting Corporation	65
American Steel & Wire Co.	—
American Telephone & Telegraph Co.	54-55
Anaconda Wire & Cable Co.	115
Ansonia Wire & Cable Co., The	—
Armstrong Cork Co., Glass Insulators	90
Arrow Fastener Co., Inc.	99
Atlantic Creosoting Co., The	111
Automatic Electric Sales Co.	58-59, 81
Bakelite Company	71
Baker Wood Preserving Co.	—
Bartlett Manufacturing Co.	106
Bartlett Tree Experts	—
Bashlin Company, W. M.	—
Bell Telephone Laboratories, Inc.	—
Benner-Nawman, Inc.	—
Berry & Co., L. M.	—
Bethlehem Steel Co.	—
Biddle Co., James G.	80
Bishop Manufacturing Corp.	78
Blaw-Knox Company	33
British Insulated Callenders' Cables, Ltd.	—
Buckeye Telephone & Supply Co.	74, 91
Burgess Manning Company	—
Burroughs Corp.	29
C&D Batteries, Inc.	76
Cabaniss-Pogue Co.	107
Cable Breather Corp.	—
Cable Spinning Equipment Co.	—
Calculagraph Company	66
Chance Co., A. B.	89
Chase Brass & Copper Co.	95
Cleveland Inst. of Radio Electronics	—
Coffing Hoist Div.	96
Colorado Fuel & Iron Co., The	—
Commercial Cord and Supply Co.	95
Communication Equipment & Engineering Co.	68
Comptometer Corporation	—
Cook Electric Company	12-13
Copperweld Steel Co.	—
Crane, Inc., Carl C.	107
Cullom & Ghertner	—
Davis Construction Co.	—
Diamond Books	94
Donnelley & Sons, R. R.	—
Dow Chemical Co., The	—
Du Pont de Nemours & Co., E. I.	—
Duo-Safety Ladder Corp.	94
Eastman Chemical Products, Inc.	49
Edmund Scientific Company	—
Electric Specialty Co.	61
Empire Steel & Wire Corp.	111
Engineering Associates, Inc.	107
Everstick Anchor Co.	—
Exide Industrial Division— The Electric Storage Battery Co.	—
Fitchburg Engineering Corporation	57
Foley Constr. Co., Robert E.	107
Free-Lock Corporation	—
General Cable Corporation	16
General Insulated Wire Works, Inc.	109
General Machine Products Co., Inc.	98
General Telephone Directory Co.	116
Gorman Rupp Company	—
Gould-National Batteries, Inc.	18
Graybar Electric Co.	—
Greenlee Tool Co.	—
Haley & Co., R. G.	—
Harris-McBurney Company	107
Henkels & McCoy	107
Highway Trailer Company	—
Hirsch Organization, Inc., Gustav	93
Holan Corp., J. H.	—
Homelite Corp.	75
Hubbard & Company	—
Indiana Steel & Wire Co.	103, 105
Industrol Corporation	—
Ingram-Richardson Mfg. Co.	97
International Business Machines Corp.	47
International Harvester Co.	—
Irwin Augur Bit Co.	84
Johns-Manville	—
Katolight Corp.	—
Kearney Co., Jas. J.	100
Kellogg Switchboard & Supply Co.	6-7, 34-35, 62-63, 92
Kennecott Wire & Cable Co.	95
Killoren Company	107
Klein & Sons, Mathias	85
Koiled Kords, Inc.	—
Koppers Co., Inc.	51
Kwikkopy Company	—
Leich Sales Corporation	4-5, 30-31
Lindsay Telephone Supply Co.	108
Line Equipment Sales	107
Lorain Products Corp., The	9
Magnolia Chemical Company, Inc.	106
McFarland Company, L. D.	111
McGrath Engineering, Inc.	107
Monsanto Chemical Co.— Plastics Div.	—
Morrison-Pelsue Co.	—
Mullen Construction Co.	107
Murphy Engineering Laboratories	97
Natco Corporation	103
National Carbon Company	67
National Pole & Treating Div.	—
National Standard Co.	39
National Telephone Supply Co.	—
Neubauer Manufacturing Co.	—
Neuses, Inc., P. K.	—
North Electric Company	10-11
Onan & Sons, D. W.	72
Orangeburg Manufacturing Co., Inc.	—
Owens-Illinois	—
Page & Hill, Inc.	—
Page Steel & Wire Div. American Chain & Cable Co., Inc.	97
Parker, W. H.	111
P-C Corporation	102
Phelps Dodge Copper Products Corp.	—
Philco Corp., Govt. & Industrial Div.	14-15
Piedmont Wood Preserving Co.	—
Plastic Wire & Cable Co.	73
Porcelain Products, Inc.	102
Porter, Inc., H. K.	89
Preformed Line Products Co.	41
Prewitt & Sons, Inc., J. R.	102
Radio Engineering Products Ltd.	—
Raytheon Mfg. Co.	—
Recordak Corp.	17
Reliable Electric Company	45
Remington Rand Div.	—
Rex Corporation, The	77
Reynolds Metals Company	—
Roebling's Sons Corp., John A.	—
Rolatape, Inc.	88
Runzel Cord & Wire Co.	—
S&G Manufacturing Corp.	79
Schauer Mfg. Co.	87
Seymour Smith & Sons, Inc.	87
Sherron Metallic Corp.	—
Sierra Electric Corp.	—
Sloan, Cook & Lowe Co.	107
Soapstone Duct Co.	—
Stainless Inc.	—
Stanley-Yankee Tools, Inc., a subsidiary of The Stanley Works	—
Stewart Bros.	100
Stewart-Warner Corp., Electronics Div.	37
Stromberg-Carlson Co.	2-3, 42, 82-83, 111
Superior Cable Corporation	69
Suttle Equipment Co.	86, 107
Taylor-Colquitt Co., The	98
Telectric Co., The	112-113
T.E.I. Corp.	107
Tele-Muff Co.	102
Telephone & Power Supply Co.	111
Teletype Corp.	—
Tele-Wire Supply Co., Inc.	111
Telkor, Inc.	111
Templeton Kenly & Co.	100
Thornhill Publishing Co.	—
Transandean Associates, Inc.	70
Truck Equipment Company	—
Tudor & Yaeger, Inc.	107
United Electric Controls Co.	93
U. S. Cable Constructors, Inc.	—
United States Independent Telephone Association	—
United States Instrument Corp.	—
United States Steel Corp. American Steel & Wire Co.	—
Universal Controls Corp.	34-35
Utica Drop Forge & Tool Div.	—
Utility Body Co.	—
Utility Tool & Body Co.	—
Weikel Line Company	107
Western Electric Co.	—
Western Hardware & Tool Co.	111
Wheelock Signals, Inc.	96
White Motor Company, The	—
Whitney-Blake Co.	52-53
Williams Inspection Co., A. W.	107
Wiremold Co., The	98
Wyoming Valley Equipment Div.	106
Yates Construction Co.	107
York-Hoover Corporation	64

WESTERN REPRESENTATIVE: McDonald-Thompson, 625 Market St., San Francisco, Cal.: 3727 W. Sixth St., Los Angeles: Colorado National Bank Bldg., Denver, Colo.; National Bldg., Seattle, Wash.: 3217 Montrose Blvd., Houston, Tex.: 2010 S. Utica, Tulsa, Okla.

Anaconda Aerial Cable—51 pairs of 22 gauge, and 202 pairs of 22 gauge—was installed at Palmer, Alaska, by Bonneville Construction Co., Idaho Falls, Idaho, for the Matanuska Telephone Association.

OPERATION NORTH-COUNTRY

At Palmer, Alaska, Anaconda Aerial Telephone Cable is installed

Alaska is one of the last great frontiers. But it's a frontier with a difference—a frontier with automobiles, airplanes . . . and the telephone!

In rich Matanuska Valley, for example, the Matanuska Telephone Association has just completed a modern dial system for 600 subscribers in and around the town of Palmer.

For the job, cable tough enough to withstand Alaskan cold, snow and wind was needed. The choice: Anaconda polyethylene insulated and jacketed aerial telephone cable, Type ATC-AD. It really stands up when temperatures go down.

Whatever your needs, *you* too will find a good answer to your problems among Anaconda 1) Aerial and Duct Cable, 2) Self-supporting Cable, 3) Direct Burial Cable, 4) Rural and Urban Distribution Wire, and 5) Anaconda Paper-lead Cable.

Phone or write: Anaconda Wire & Cable Company, 25 Broadway, New York 4, N. Y., or any of our 27 District Offices. There's a qualified telephone-cable expert ready to help you. 57334

LIVE BETTER ELECTRICALLY

PHONE THE MAN FROM ANACONDA®

FOR TELEPHONE CABLE

XUM

up a tree?

Increased costs edging you out on a limb? Maybe we can help. Records show that our Complete Directory Service Plan is operating successfully for independent telephone companies in 4400 communities. We handle everything. Turn out good looking directories . . . with fewer headaches, more income.

Like to know how? We'll be happy to show you. Just call or write our nearest office.

GENERAL SYSTEM

GENERAL TELEPHONE DIRECTORY COMPANY

1800 Busse Highway • DES PLAINES, ILLINOIS • VAnderbilt 4-2164

Divisional Sales Offices

COLUMBIA, Mo. • 811 Cherry Street • Gibson 2-6907
DURHAM, N.C. • 108 E. Parrish Street • Tel: 5133
ERIE, Penna. • G. Daniel Baldwin Building • Tel: 2-4187
FORT WAYNE 2, Ind. • 229 E. Berry Street • Eastbrook 3477
LEXINGTON, Kentucky • 157 Walnut Street • Tel: 4-7626
LONG BEACH 15, Calif. • 1775 Ximeno Ave. • GEneva 3-7441
MADISON, Wisconsin • Tenney Building • ALpine 7-1667
SAN ANGELO, Texas • 110 South Taylor St. • Tel: 6738
SPOKANE, Wash. • 108 N. Washington St. • MAdison 4-4336
SPRINGFIELD, Ill. • Myers Bros. Building • Tel: 8-3425

DEC 16 19